LEADER

ELECTRONIC MEASURING INSTRUMENTS

1986/87

LEADER ELECTRONICS CORP.

LEADER'S WORLD-WIDE

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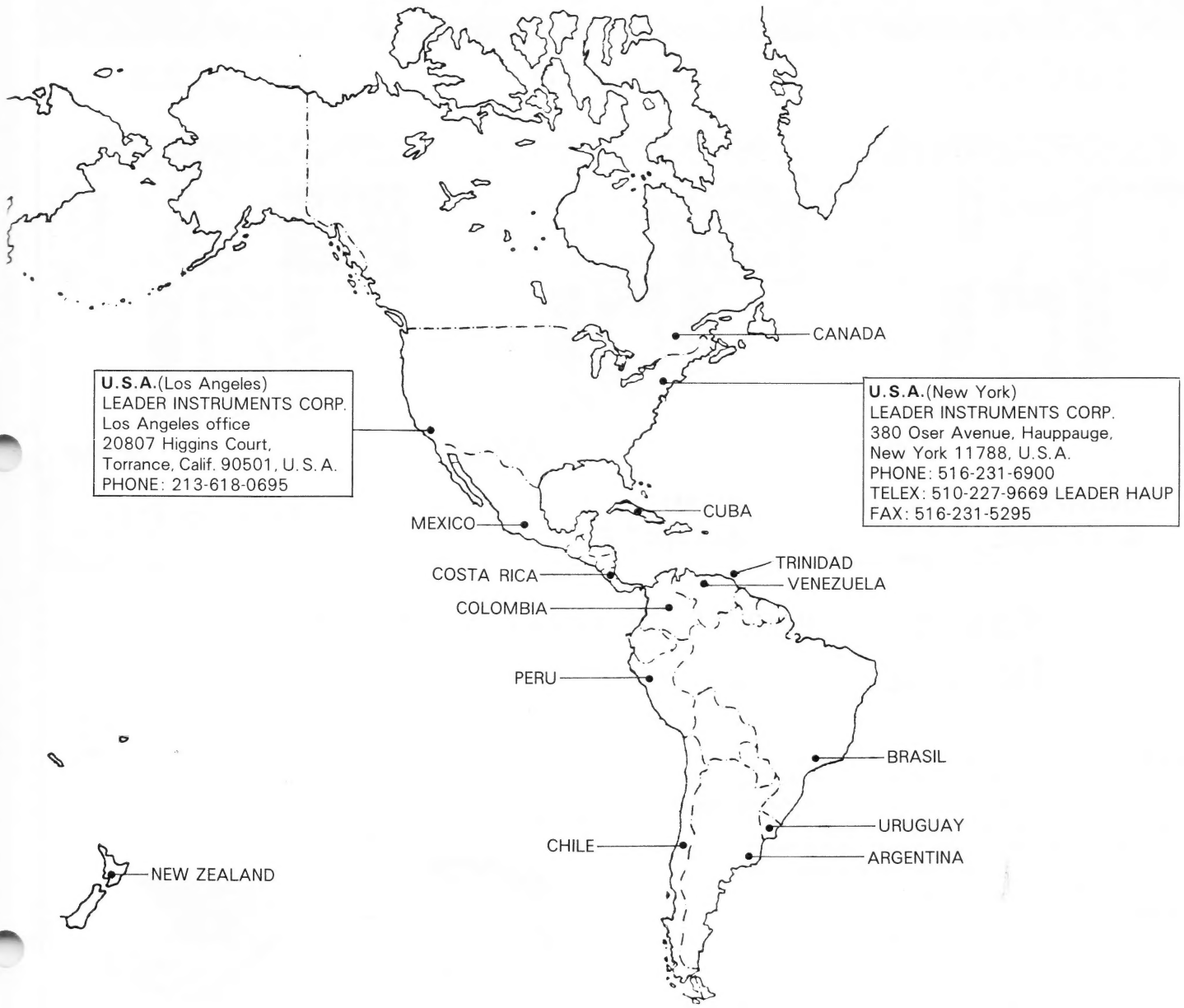
CONTENTS

INDEX (BY MODEL NUMBER)

SALES/SERVICE NETWORK

are indicated with their full names & addresses.

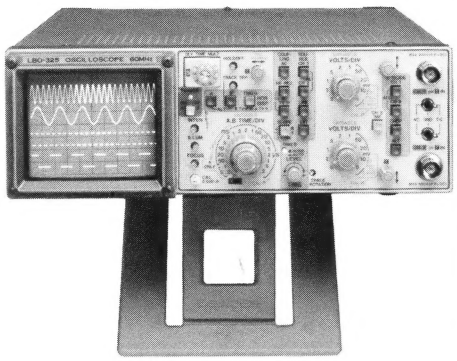
exclusive sales/service agents exist.



Oscilloscope

MINIATURE PORTABLE OSCILLOSCOPES

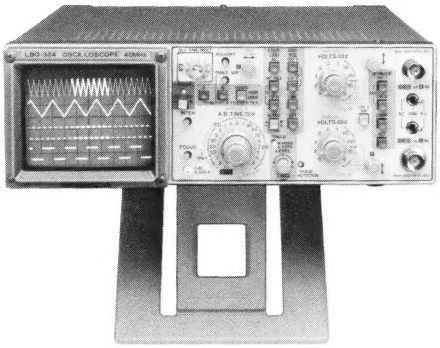
LBO-325



NEW

60MHz, 2-CH
4-TRACE

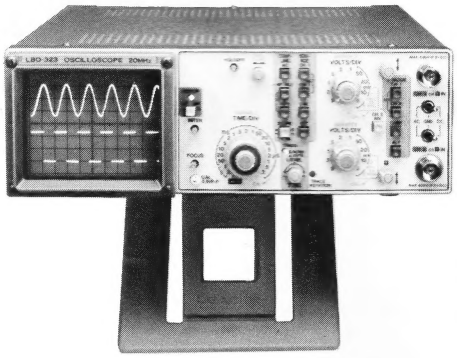
LBO-324



NEW

40MHz, 2-CH
4-TRACE

LBO-323



NEW

20MHz, 2-CH

Magazine Size Oscilloscopes Feature Superb Portability, Ease of Operation and Easy–To–View CRT Display.

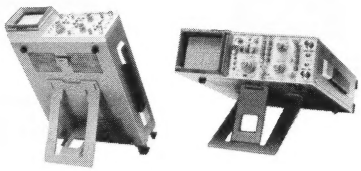
The LBO-325, -324, and -323 are oscilloscopes that can handle frequency bands of 60MHz, 40MHz, and 20MHz with a sensitivity of 5mV (1mV MAG). All are approximately magazine size and fit comfortably into a briefcase or the like.
Being compact and lightweight, these oscilloscopes have a large 95mm CRT display and provide an equivalent measuring accuracy of larger instruments. The interiors include a glass-epoxy PC board with a minimum of wiring. In addition to these quality design features are automated assembly by a chip mounter, aluminum die-cast frames, and panels marked with permanent character. These features provide truly portable oscilloscopes that are tough and adaptable to the most demanding operation requirements.

Common Features (LBO-325·324·323)

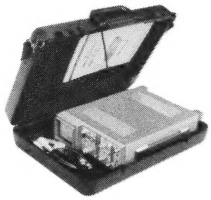
- 3.5-inch rectangular internal graticule CRT display without parallax.
- Auto-focusing assures optimal traces at all times.
- TV-V and TV-H synchronization stabilizes display of video waveforms.
- ALT triggering synchronizes two signals having a different timing relationship.
- Variable holdoff time function displays the phase relationship of still logic signals.
- CH-1 output signal is useful as a buffer amplifier.
- Quality-oriented design features, including a glass-epoxy PC board and automated assembling.
- All controls are located on the front panel.
- Sturdy aluminum die-cast frames for extra strength.

NEW-TYPE TILT STAND

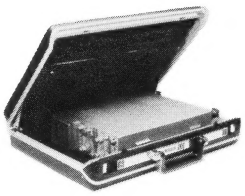
Better view angles can be selected for better observation in 2 positions by newly designed tilt stand. This tilt stand has no obstacle in putting the main frame in carrying case. (PAT. PEND.)



The attache case specially designed for these scopes is available as a standard accessory for LBO-325 and as an optional accessory for LBO-323/324.

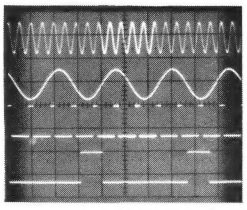


These scopes easily fit a standard 3-inch attache case too.



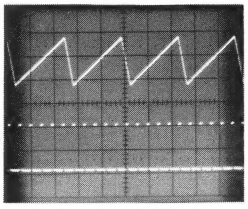
ALT Sweep Function Displays Waveforms by Main and Delayed Sweep Alternately.

LBO-325·324



The alternate (ALT) sweep function displays the main sweep (A INTEN BY B) and delayed sweep (B) alternately, thereby facilitating their comparison and location of magnified portions.

ALT Triggering Positively Synchronizes Two Waveforms Having Different Frequencies.



The ALT triggering function permits the display of two unrelated signals (asynchronous signals) in completely synchronized and still forms. ALT triggering does not affect the movement of the vertical positioning.

Oscilloscope

■ SPECIFICATIONS

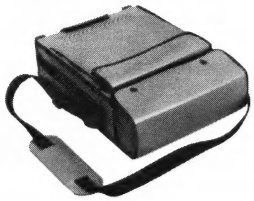
MODEL	LBO-325	LBO-324	LBO-323
CRT Display Type	95mm Rectangular, Internal-graticule, Metal back and Aluminized Screen		95mm Rectangular, Internal-graticule, 95FB31
Scale with Illumination Lamp	Adjustment on front panel	———	
Acceleration Voltage	Post-acceleration, 2kV/12kV stabilized		1.7kV stabilized
Effective Display Area Beam Rotator Intensity Modulation	8 x 10 div (1 div = 6.35mm) Adjustment on front panel Blanked by TTL H level signal		
Vertical Amplifier Sensitivity Calibration Accuracy	(Identical for both channels) 5mV/div~5V/div (325:60MHz, 324:40MHz, 323:20MHz), 1mV/div~2mV/div (5MHz: MAG x 5 ON), 1-2-5 sequence, 10 steps and continuous adjuster ±3% (±5%: MAG x 5 ON)		
Bandwidth (REF. 8 div)	DC~60MHz, –3dB	DC~40MHz, –3dB	DC~20MHz, –3dB
	DC~5MHz, –3dB (MAG x 5)		
Rise Time	5.8ns (70ns: MAG x 5)	8.8ns (70ns: MAG x 5)	17.5ns (70ns: MAG x 5)
Signal Delay Time	Approx. 20ns (on CRT face)	———	
Input Impedance Max. Input Voltage Display Modes Polarity Invert	1MΩ±1.5%, 30pF±5pF (Tolerance: within ±2pF) 400V (p-p + DC) CH-1, CH-2, CHOP, ALT and ADD CH-2 INVERT		
CH-1 Output	Approx. 50mVdiv into 50Ω, (DC~60MHz, –3dB)	Approx. 50mV/div into 50Ω, (DC~40MHz, –3dB)	Approx. 50mV/div into 50Ω, (DC~20MHz, –3dB)
Horizontal Amplifier Sweep Method	Trigger sweep, Automatic trigger sweep, Continuously by delayed sweep, Trigger delayed sweep and ALT sweep		Trigger sweep and Automatic trigger sweep
A Sweep Time	0.2μs/div~0.2s/div, 1-2-5 sequence 19 steps with continuous adjuster		
B Sweep Time	0.2μs/div~0.5ms/div, 11 steps		———
Calibration Accuracy Hold-off Variable	±3% One sweep or more		
Delay Time Jitter Magnifier Max. Sweep Time	1/1000 x 10±5% 20ns/div (MAG x 10 ON)		——— x 5±5% 40ns/div (MAG x 5 ON)
Synchronization Signal Sources Coupling Slope	CH-1, CH-2, ALT, LINE, EXT AC, HF-REJ, TV-V, TV-H +, – (indicates polarity of video signal)		

Sensitivity	Bandwidth	INT.	EXT.	Bandwidth	INT.	EXT.	Bandwidth	INT.	EXT.
NORM	30Hz~10MHz 2Hz~60MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p	30Hz~10MHz 2Hz~40MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p	30Hz~10MHz 2Hz~20MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p
AUTO	30Hz~10MHz 30Hz~60MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p	30Hz~10MHz 30Hz~40MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p	30Hz~10MHz 30Hz~20MHz	0.5div 1.5div	0.2Vp-p 0.6Vp-p

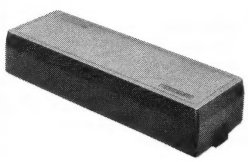
TV Synchronization	Synchronizing composite video signal Slope switch is selected according to polarity of video signals.		
	If main trigger (A TIME) is set to TV-V sync., a magnified trigger (B TIME) is automatically set to TV-H sync.		———
X-Y Mode Sensitivity Bandwidth X-Y Phase	(X = CH-1, Y = CH-2) Same as Vert. Amplifier X axis: DC (10Hz)~1MHz, Y axis: Same as Vert. Amplifier Less than 3° at 100kHz		
Calibrator	0.5Vp-p ±2%, Approx. 1kHz, square wave		
Power Supply	AC 100V, 50/60Hz		
	20W	22W	30W
Size and Weight	230(W) x 75(H) x 290(D) mm, Approx. 4kg		
Accessories	BNC terminal adaptor . . . . . 2, Fuse 1		
	Low capacitance probe LP-060X (1/1, 1/10) 2	Low capacitance probe LP-16BX (1/1, 1/10) 2	
	Attache case (LC-2223) . . . . . 1 Hood 1	Option	

Optional Accessories

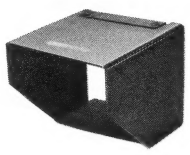
■ **Carrying Case**
LC-2221



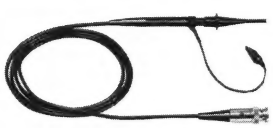
■ **Front-Panel Cover**
LC-2131



■ **Hood**
LH-2008



■ **Probe DC~60MHz**
LP-060X (1/1, 1/10)



Oscilloscope

100MHz OSCILLOSCOPE

LBO-518

4-CH, 8-TRACE, DELAYED SWEEP, DELAY LINE

The LBO-518 is a 100 MHz oscilloscope with all of the features normally found on a lab-grade scope: Stable operation, dual time base with sweep delay, flexible triggering facilities, and a bright CRT display with internal graticule. Moreover, it also has a flat rectangular face, a feature found on few scopes in any price class: it can simultaneously display up to eight traces from four different input signals. In addition to the two vertical input channels, the signals used to externally trigger the main and delayed time bases can appear on the CRT display. The alternate sweep mode, which allows the input signal to be simultaneously displayed by both the main time base and the delayed time base, effectively doubles this four-trace display to an eight trace display.
The comprehensive triggering capability of the LBO-518 includes several features that ease the problem of triggering on complex signals; a variety of frequency-selective coupling filters, a trigger hold-off control, and trigger pick-off that alternates between the two vertical channels.

■ FEATURES

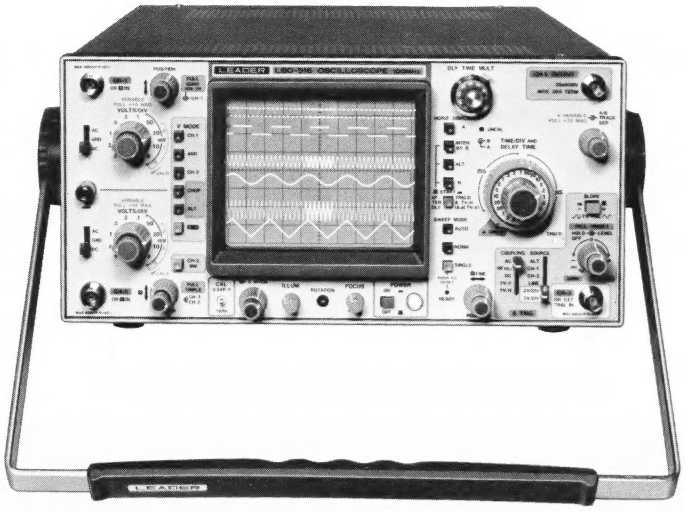
- Newly developed rectangular dome meshed CRT (6-inch diagonal) for large screen area and high brightness display with 20-kV acceleration voltage.
- Wide bandwidth of 100MHz can be measured at high sensitivity of 5mV/div. Further the sensitivity is quickly magnified to extra high sensitivity of 500μV/div (5MHz) by the 10 times magnifier, thus enabling accurate measurement of feeble video signals, ripples of a stabilized power supply.
- Linked switch function for A/B sweepings to prevent mis-operation of delayed sweeping.
- Various alarm indicators to eliminate mis-operations.

■ SPECIFICATIONS

CRT Display				
Type	150mm Rectangular, Internal-graticule, post-acceleration, scale with illumination lamp			
Acceleration Voltage	20kV/2kV			
Effective Display Area	8 x 10 div (1 div = 10mm)			
Intensity Modulation	Blanked by TTL level signal			
Vertical Amplifier				
CH-1, CH-2, Input Sensitivity	(Identical for both channels) 5mV/div ~5V/div (100MHz) 500μV/div ~ 2mV/div (5MHz; MAG x 10 ON)			
Calibration Accuracy	±3% (±5%; MAG x 10)			
Input Impedance	1MΩ ±2% 25pF ±3pF			
Bandwidth	DC ~ 100MHz (REF. 8 div)—3dB DC ~ 5MHz (REF. 8 div)—3dB (MAG x 10)			
Rise Time	3.5ns (70ns; MAG x 10)			
Input Coupling	AC-GND-DC			
Maximum Input	600V (DC + ACp-p)			
CH-3, CH-4 Input Sensitivity	(A, B EXT. TRIG. IN) CH-3; 0.2V/div, 2V/div CH-4; 0.2V/div, 2V/div			
Calibration Accuracy	± 3%			
Input Impedance	1MΩ ±2% 25pF ±3pF			
Bandwidth	DC ~ 100MHz —3dB			
Rise Time	3.5ns			
Maximum Input	600V (DC + ACp-p)			
CH-1, CH-2, CH-3, CH-4 Input Signal Delay Time	approx. 20ns, permits viewing of leading edge to waveform			
Display Modes	CH-1, CH-2, ADD (CH-1 ± CH-2) DUAL (ALT, CHOP): CH-1, CH-2 TRIPLE (ALT, CHOP): CH-1, CH-2, CH-3 QUAD (ALT, CHOP): CH-1, CH-2, CH-3 CH-4			
Polarity	CH-2 INVERT			
X-Y Mode				
Sensitivity	(X axis = CH-1, Y axis = CH-2) Same as Vertical Amplifier			
Phase Difference	Within 3° at 100kHz			
Bandwidth	DC (10Hz) ~ 3MHz —3dB (X axis)			
CH-1 OUT PUT				
Output Voltage	25mVp-p/div (50Ω on load)			
Bandwidth	DC (10Hz) ~ 100MHz — 3dB			
Output Impedance	50Ω			
Horizontal Amplifier				
Sweep Mode	Trigger sweep, Automatic trigger sweep, Single sweep, Continuous delayed sweep, Trigger delayed sweep, Single delayed sweep, and Alternate sweep			
A Sweep Time	20ns/div ~ 0.5s/div 1-2-5 sequence 23 steps and continuous adjuster			
B Sweep Time	20ns/div ~ 0.5s/div 1-2-5 sequence 23 steps			
Calibration Accuracy	± 3%			
Hold-off Time	Variable one sweep period or more (Only 0.5s/div; 0.5 sweep period or more)			
Delay Time Jitter	1/20000			
Magnifier	x10 ±5%			
Maximum Sweep Speed	2ns/div (MAG x 10)			
A, B Sweep Gate Output	approx. +5V at open			
Synchronization				
Signal Sources	A Sweep: CH-1, ALT, CH-2, LINE EXT.(0.2V/div), EXT (2V/div) B Sweep: CH-1, ALT, CH-2, EXT (0.2V/div), EXT. (2V/div)			
Coupling	A Sweep: AC, HF-REJ, LF-REJ, DC, TV-V, TV-H B Sweep: AC, HF-REJ, LF-REJ, DC, TV-H			
Slope	+ or —			
Sensitivity		Bandwidth	INT.	EXT.
	NORM	DC~10MHz	0.4div	0.5V
		DC~100MHz	1.5div	1.5V
	AUTO	30Hz~10MHz	0.4div	0.5V
		30Hz~100MHz	1.5div	1.5V
Calibrator				
Output Voltage	0.5Vp-p ±1%			
Waveform	Square wave of 1kHz ±2%			
Power Supply	AC100,120,200,220,240V 50/60Hz, 65W			
Size and Weight	305(W) x 145(H) x 400(D)mm 9.5kg			
Accessories	Probe LP-100X ... 2 Fuse (Time-Lag) ... 1 BNC Terminal Adaptor 2			

100MHz OSCILLOSCOPE

LBO-516



3-CH, 8-TRACE, DELAYED SWEEP, DELAY LINE

The LBO-516 is a portable oscilloscope that provides a max. sensitivity of 5mV/div (100MHz), 500μV/div (5MHz), a max. sweep time of 2ns/div (MAG x 10), and is equipped with 15cm rectangular CRT display. This model can be used in a wide range of research, production, and service applications for measuring and testing TV sets, VTRs and computer peripheral equipment. This is made possible by the TV synchronization separator, Hold-off variable, 3CH·8-trace, and CH-1 OUT functions.

■ FEATURES

- CRT: 150mm (6 inch) rectangular, internal-graticule scale, dome mesh type, and 20kV acceleration voltage for high-brightness display using an illumination lamp.
- Auto focus maximizes visual clarity.
- Wide bandwidth and high sensitivity of 100MHz/5mV (500μV: MAG x 10)
- Logic timing is obtained in triple traces.
- Sweep delay offers high calibration.
- Signal delay line is used for accurate measurement of rise-time of high-speed pulses.
- TRIG VIEW (internal CH-3) ensures synchronization signals.
- ALT sweep simultaneously displays primary sweep and sweep acceleration.
- 3CH·8-trace and B ENDS A functions.
- 4 traces display of CH-1, CH-2, CH-3, and ADD (CH-1 ± CH-2).
- B sweep TV-H synchronization provides stable display of VITS and Video Disc control codes.
- ALT trigger synchronizes different two waveforms.
- Hold-off variable synchronizes complex waveforms.
- CH-1 OUT drives the frequency counter.
- PRESET TRIG. eliminates synchronization control.
- Single sweep function is useful for single trace display.
- Various alarm indicators on the front panel prevent operation errors.

■ SPECIFICATIONS

CRT Display				
Type	150mm Rectangular, Internal-graticule, post-acceleration, scale with illumination lamp			
Acceleration Voltage	20kV/2kV			
Effective Display Area	8 x 10div (1div=10mm)			
Intensity Modulation	Blanked by TTL level signal			
Vertical Amplifier				
CH-1, CH-2, Input	(Identical for both channel)			
Sensitivity	5mV/div ~ 5V/div (100MHz) 500μV/div ~ 2mV/div (5MHz: MAG x 10)			
Calibration Accuracy	±3% (±5%: MAG x 10)			
Input Impedance	1MΩ±2% 25pF±3pF			
Bandwidth	DC~100MHz (REF. 8 div), −3dB DC~ 5MHz (REF. 8 div), −3dB (MAG x 10)			
Rise Time	3.5ns (70ns: MAG x 10)			
Input Couling	AC-GND-DC			
Maximum Input	400V (ACp-p + DC)			
CH-3 Input (A EXT TRIG IN)				
Sensitivity	0.2V/div, 2V/div			
Calibration Accuracy	±3%			
Input Impedance	1MΩ±2% 25pF±3pF			
Bandwidth	DC~100MHz, −3dB			
Rise Time	3.5ns			
Maximum Input	400V (ACp-p + DC)			
Signal Delay Time	approx. 20ns, permits viewing of leading edge to waveform			
Display Modes	CH-1, CH-2, ADD (CH-1±CH-2) DUAL (ALT, CHOP): CH-1, CH-2 TRIPLE (ALT, CHOP): CH-1, CH-2, CH-3 QUAD (ALT, CHOP): CH-1, CH-2, CH-3, ADD (CH-1±CH-2)			
Polarity	CH-2 INVERT			
X-Y Mode				
Sensitivity	(X axis = CH-1, Y axis = CH-2) Same as Vertical Amplifier			
Phase Difference	Within 3° at 100kHz			
Bandwidth	DC (10Hz) ~ 3MHz, −3dB (X axis)			
CH-1 Out Terminal				
Output Voltage	25mVp-p/div (50Ω on load)			
Bandwidth	DC (10Hz) ~ 100MHz, −3dB			
Horizontal Amplifier				
Sweep Method	Trigger sweep, Automatic trigger sweep, Single sweep, Continuous delayed sweep, Trigger delayed sweep, Single delayed sweep, and Alternate sweep			
A Sweep Time	20ns/div ~ 0.5s/div 1-2-5 sequence 23 steps and continuous adjuster			
B Sweep Time	20ns/div ~ 50ms/div 1-2-5 sequence 20 steps			
Calibration Accuracy	±3%			
Hold-off Time	Variable one sweep period or more (Only 0.5s/div; 0.5 sweep period or more)			
Delay Time Jitter	1/20000			
Magnifier	x10±5%			
Maximum Sweep Speed	2ns/div (MAG x 10)			
Linearity	±3% (±5%: MAG x 10)			
Synchronization				
Signal Sources	A Sweep: CH-1, ALT, CH-2, LINE EXT. (0.2V/div), EXT (2V/div) B Sweep: The Synchronized signal source for the A-sweep is used.			
Coupling	A Sweep: AC, HF-REJ, DC, TV-V, TV-H B Sweep: The synchronized signal source for the A-sweep is used. (The B-sweep is set at TV-H when the synchronized signal source for the A-sweep is set at TV-V.)			
Slope	+ or −			
Sensitivity		Bandwidth	INT.	EXT.
	NORM	DC~ 10MHz	0.4div	0.1V
		DC~100MHz	1.5div	0.4V
	AUTO	30Hz~ 10MHz	0.4div	0.1V
		30Hz~100MHz	1.5div	0.4V
Calibrator				
Output Voltage	0.5Vp-p±1%			
Waveform	square wave of 1kHz			
Power Supply	AC 100V 50/60Hz, 65W			
Size and Weight	305(W) x 145(H) x 400(D)mm, 9.5kg			
Accessories	Probe LP-100X . . . . . 2 Fuse (Time-Lag) . . . . . 1 BNC Terminal Adaptor 2			

Oscilloscope

60MHz OSCILLOSCOPE

LBO-526

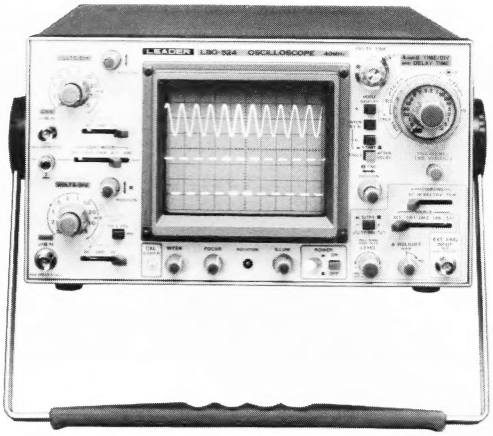
NEW

DUAL TRACE, DELAYED SWEEP, DELAY LINE

The LBO-526 oscilloscope is a portable one with the functions of 5mV/div. (60MHz), 500μV/div. (5MHz), maximum sweep rate 20ns/div. (MAGx10), and delayed sweep, equipped with a 6-inch rectagular metal-back CRT with high brightness, internal graticule. The LBO-526 has a wide range of application in production and service areas for measurements and testings of TV set, VTRs and computer peripheral equipments, since the TV synchronization separator, variable hold off and V-AXIS magnifier functions are provided.

40MHz OSCILLOSCOPE

LBO-524/524L



DUAL TRACE, DELAYED SWEEP, DELAY LINE (LBO-524L ONLY)

The LBO-524[L] oscilloscope is a portable one with the functions of 5mV/div. (35MHz), 500μV/div. (5MHz), maximum sweep ratio 20ns/div. (MAGx10), and delayed sweep, equipped with a 6-inch rectangular metal-back CRT with high brightness, internal graticule and the vertical sensitivity magnifier. The LBO-524[L] has a wide range of application in production and service areas for measurements and testings of TV set, VTRs and computer peripheral equipments, since the TV synchronization separator, variable hold off and V-AXIS magnifier functions are provided.

■ SPECIFICATIONS

MODEL	LBO-526	LBO-524/524L
CRT Display Type	150mm Rectangular, Internal-graticule: 8x10 div. (1div = 10mm), Flat-face, Illumination	
Acceleration Voltage Intensity Modulation	12kV/2kV stabilized (P.D.A) Blanked by TTL level signal	7kv/2kV regulated (P.D.A) Blanked by TTL level signal
Vertical Amplifier Sensitivity	(Identical for both channels) 5mV/div ~ 5V/div (60MHz) 500μV/div ~ 2mV/div (5MHz: MAG x 10)	(Identical for both channels) 5mv/div ~ 5V/div (40MHz) 500μV/div ~ 2mV/div (5MHz: MAG x 10)
Calibration Accuracy	±3% (±5%: MAG x 10)	
Bandwidth Rise Time	DC (10Hz) ~ 60MHz –3dB 5.8ns (70ns: MAG x 10)	DC (10Hz) ~ 40MHz –3dB 10ns (70ns: MAG x 10)
Display Modes	CH-1, CH-2, CHOP, ALT, ADD, CH-2 INVERT	
CH-1 OUT	Approx. 50mV/div (50Ω on load), DC ~ 60MHz	0.1V/div (50Ω on load), DC ~ 40MHz
Horizontal Amplifier Sweep Method	Trigger sweep, Auto-trigger sweep, Continuous delayed sweep, Trigger delayed sweep	
Sweep Time	A sweep: 0.2μs ~ 0.2s/div, B sweep: 0.2μs ~ 0.5ms/div, Accuracy: ±3%	
Hold-off Variable Delay Time Jitter Magnifier, Max. Sweep Time	One sweep or more 1/10,000 x10±5%, 20ns/div (MAG x 10)	
Synchronization	Signal Sources: ALT, CH-1, CH-2, LINE, EXT Coupling: AC, HF-REJ, TV-V, TV-H	

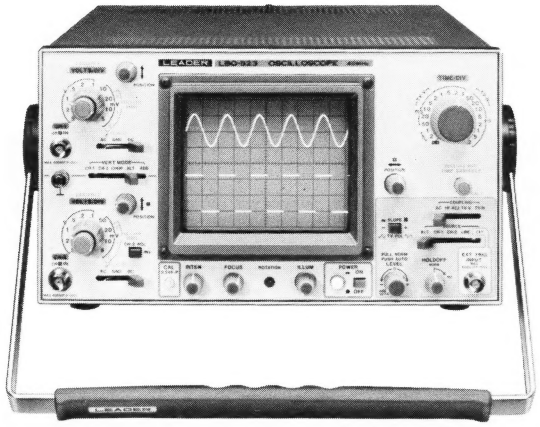
Sensitivity		Bandwidth	INT.	EXT.		Bandwidth	INT.	EXT.
	NORM	30Hz~10MHz 2Hz~60MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p	NORM	30Hz~10MHz 2Hz~40MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p
	AUTO	30Hz~10MHz 30Hz~60MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p	AUTO	30Hz~10MHz 30Hz~40MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p

X-Y Mode(X=CH-1, Y=CH-2)	Sensitivity: Same as Vert. Amplifier X axis Bandwidth: DC (10Hz) ~ 1MHz, –3dB X-Y Phase: Less than 3° at 100kHz	
Calibrator	0.5Vp-p ±2%, 1kHz square wave	
Power Supply Size and Weight	AC100, 120, 200, 220, 240V, 50/60Hz, 55W 290(W) x 160(H) x 375(D) mm, 9kg	AC100, 120, 200, 220, 240V, 50/60Hz, 50W 290(W) x 160(H) x 375(D) mm, 8.5kg
Accessories	Direct/LOW capacitance probe LB-060X . . . 2	Direct/LOW capacitance probe LP-16BX . . 2
	Time lag fuse . . 1 BNC terminal adaptor . . 2	

Oscilloscope

40MHz OSCILLOSCOPE

LBO-523

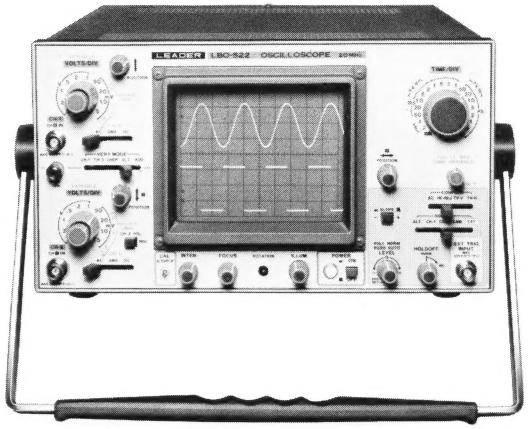


DUAL TRACE, 5mV(500μV)

- CRT: 150mm, Rectangular, Internal-graticule (8 x 10 div, 1div = 10mm), Post-acceleration, Flat-face, Metal-back, Dome-mesh, % Scale, Scale Illumination, Beam Rotation
- Wide Bandwidth: 40MHz (5mV, 8 div Ref.)
- Max. Sensitivity: 500μV (5MHz: MAG x 10)
- Max. Sweep Speed: 20ns/div (MAG x 10)
- TV-V, TV-H Sync. Separation • ALT Trigger
- Hold-off Variable • X-Y Operation can be controlled manually & by REMOTE • PRESET Synchronization
- Linkage of Frequency Counter Using CH-1 OUT
- TTL level Z MOD.

20MHz OSCILLOSCOPE

LBO-522



DUAL TRACE, 5mV(500μV)

- CRT: 150mm, Rectangular, Internal-graticule (8 x 10 div: 1div = 10mm), stabilized-acceleration (2kV), Flat-face, % Scale, Scale-illumination, Beam Rotation
- Wide Bandwidth: 20MHz (5mV, 8 div Ref.)
- Max. Sensitivity: 500μV (5MHz: MAG x 10)
- Max. Sweep Speed: 40ns/div (MAG x 5)
- TV-V, TV-H sync Separation • ALT Trigger
- Hold-off Variable • X-Y Operation • PRESET-Sync
- Linkage of Frequency Counter Using CH-1 OUT
- TTL level Z MOD.

■ SPECIFICATIONS

MODEL	LBO-523	LBO-522
CRT Display Type	150mm Rectangular, Internal-graticule: 8 x 10 div (1div = 10mm), Illumination	
Acceleration Voltage	7kV/2kV regulated (P.D.A)	2kV stabilized
Intensity Modulation	Blanked by TTL level signal	
Vertical Amplifier Sensitivity	(Identical for both channels) 5mV/div ~ 5V/div (40MHz) 500μV/div ~ 2mV/div (5MHz: MAG x 10)	(Identical for both channels) 5mV/div ~ 5V/div (20MHz) 500μV/div ~ 2mV/div (5MHz: MAG x 10)
Calibration Accuracy	±3% (±5%: MAG x 10)	
Bandwidth Rise Time	DC (10Hz) ~ 40MHz –3dB 10ns (70ns: MAG x 10)	DC (10Hz) ~ 20MHz –3dB 17.5ns
Display Modes	CH-1, CH-2, CHOP, ALT, ADD, CH-2 INVERT	
CH-1 OUT	0.1V/div (50Ω on load), DC ~ 40MHz	0.1V/div (50Ω on load), DC ~ 20MHz
Horizontal Amplifer		
Sweep Time	0.2μs ~ 0.2s/div, Accuracy: ±3%	
Hold-off Variable	One sweep period or more	
Magnifier, Max. Sweep Speed	x10±5%, 20ns/div (MAG x 10)	x5±5%, 40ns/div (MAG x 5)
Synchronization Signal Source Coupling	ALT, CH-1, CH-2, LINE, EXT AC, HF-REJ, TV-V, TV-H	

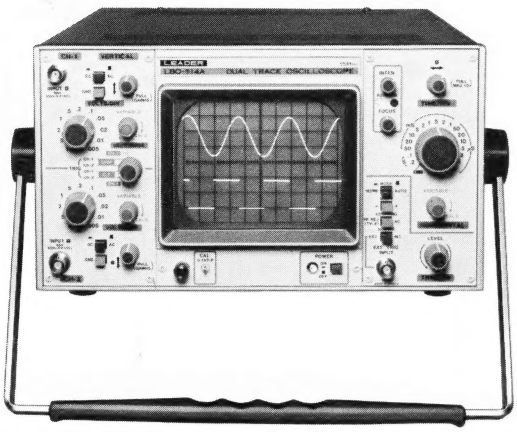
Sensitivity		Bandwidth	INT.	EXT.		Bandwidth	INT.	EXT.
	NORM	30Hz~10MHz 2Hz~40MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p	NORM	30Hz~10MHz 2Hz~20MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p
	AUTO	30Hz~10MHz 30Hz~40MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p	AUTO	30Hz~10MHz 30Hz~20MHz	0.5 div 1.5 div	0.2Vp-p 0.6Vp-p

X-Y Mode Sensitivity X axis Bandwidth X-Y Phase	(X = CH-1, Y = CH-2) Same as Vert, Amplifier DC (10Hz) ~ 1MHz, –3dB Less than 3° at 100kHz
Calibrator	0.5Vp-p±2%, 1kHz square wave
Power Supply	AC100, 120, 200, 220, 240V, 50/60Hz, 50W / AC100, 120, 220, 240V, 50/60Hz, 55W
Size and Weight Accessories	290(W) x 160(H) x 375(D) mm, 8.5kg Direct/LOW capacitance probe LP-16BX (2), BNC terminal adaptor (2), Time lag fuse (1)

Oscilloscope

15MHz OSCILLOSCOPE

LBO-514A

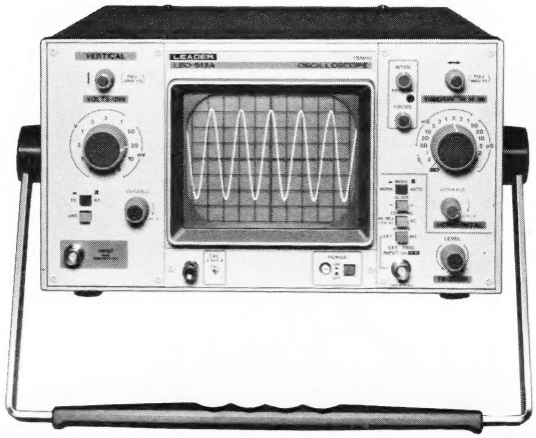


DUAL TRACE, 5mV (1mV)

LBO-514A is a dual trace oscilloscope with bandwidth of DC-15MHz and sensitivity of 5mV (1mV/div). With the adoption of 130mm highly bright C.R.T., large display in highly spot brilliancy and clearness is to be obtained. Engineered for service in the field of audio, television, VTR, computer with wide bandwidth, LBO-514A is portable, easy and convenient in operation for use in school.

15MHz OSCILLOSCOPE

LBO-513A



5mV (1mV)

LOB-513A is a single trace oscilloscope with bandwidth of DC-15MHz and sensitivity of 5mV/div (1mV/div). With the adoption of 130mm highly bright C.R.T., large display in highly spot brilliancy and clearness is to be obtained. Engineered for service in the field of audio, television, VTR, computer with wide bandwidth, LBO-513A is portable, easy and convenient in operation for use in shcool.

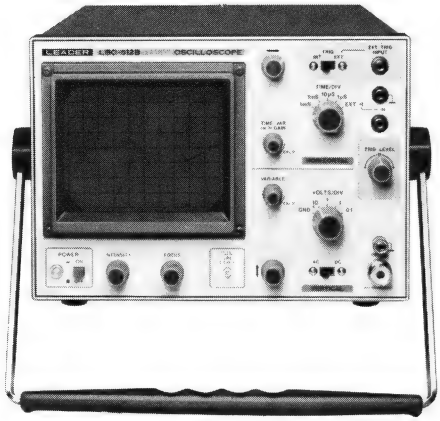
■ SPECIFICATIONS

MODEL	LBO-514A				LBO-513A			
CRT Display Type	130mm, Round 130BXB31							
Acceleration Voltage Effective Display Area Intensity Modulation	Approx. 1800V stabilized 8 x 10 div (1 div = 10mm) Blanked by TTL level signal							
Vertical Amplifier	(Identical for both channels)				———			
Sensitivity	5mV/div ~ 10V/div (15MHz), 1-2-5 sequence, 11 steps, GAIN x 5 switch 1mV/div ~ 2V/div (6MHz), Accuracy: ±3%							
Bandwidth Rise Time Input Impedance Max. Input Voltage	DC (2Hz) ~ 15MHz –3dB (REF. 6 div) 23ns (60ns: GAIN x 5) 1MΩ shunted by 35pF ± 5pF 600V (DC + ACp-p)							
Mode	CH-1, CH-2, X-Y, CHOP, ALT				———			
Horizontal Amplifier	Sweep Speed : 0.5μs/div ~ 0.2s/div, 18 steps, 1-2-5 sequence, Accuracy: ±5% Magnifier : x5±5% (max. speed 100ns/div)				———			
X-Y Mode Sensitivity Bandwidth X-Y Phase	(X = CH-1, Y = CH-2) X axis: 5mV/div ~ 10V/div Y axis: 5mV/div ~ 10V/div (Gain x 5: 1mV/div ~ 2V/div) X axis: DC (2Hz) ~ 800kHz –3dB Less than 3° at 100kHz				———			
Synchronization								
Signal Source	Internal (CH-1 or CH-2) or EXT, + or — slope				Internal (INT) or External (EXT), + or — slope			
Sensitivity		Bandwidth	INT.	EXT.		Bandwidth	INT.	EXT.
	NORM	2Hz~15MHz	1 div	0.2Vp-p	NORM	2Hz~15MHz	1 div	0.2Vp-p
	AUTO	50Hz~15MHz	1 div	0.2Vp-p	AUTO	50Hz~15MHz	1 div	0.2Vp-p
Calibrator Power Supply	Square wave (1kHz), 0.5Vp-p ±3% AC100, 120, 220, 240V, 50/60Hz, 33W							
Size and Weight	290(W) x 160(H) x 375(D) mm, 7.8 kg				290(W) x 160(H) x 375(D) mm, 7.5 kg			
Accessories	Direct/Low capacitance probe LP-16BX . . . 2 BNC terminal adaptor . . . . . 2 Time lag fuse 1				Direct/Low capacitance probe LP-16BX . . . 1 BNC terminal adaptor . . . . . 1 Time lag fuse 1			

Oscilloscope

10MHz OSCILLOSCOPE

LBO-512B

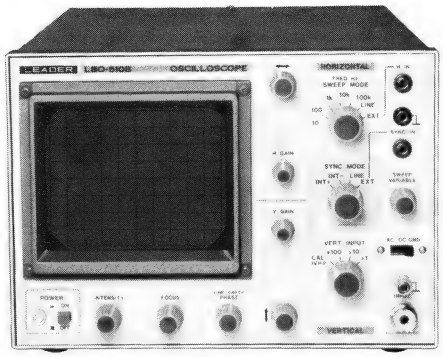


10mV

The LBO-512B is a light, compact, versatile triggered scope equipped with a 130 mm high-brilliance cathode ray tube which is 2 times as bright as the conventional one. Its excellent performance characteristics permit a variety of uses in adjustments and testing of TV sets, radios, amateur radio equipment and other home entertainment equipment as well as in monitoring of various instruments.

4MHz OSCILLOSCOPE

LBO-510B

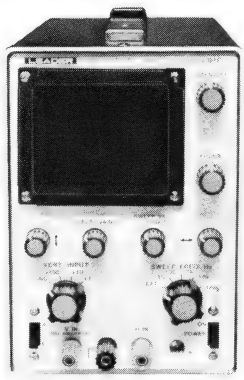


20mV

LBO-510B is a compact general purpose 130mm oscilloscope with wideband (DC ~4MHz) and high sensitivity (20mVp-p/div) characteristics. It is designed for maximum usefulness in service shops, technical schools and laboratories. It features FET's in input circuits, DC-coupled amplifiers, phases (up to 140°) line frequency sweep and vertical calibration voltage. Return trace blanking is provided for clear waveform display.

4MHz OSCILLOSCOPE

LBO-310A



20mV

LBO-310A is a general purpose 75mm oscilloscope with high sensitivity (20 mVp-p/div, 1div = 6mm) and a bandwidth from DC to 4MHz. It is designed for heavy duty in service shops, technical schools and amateur radio stations. It features DC-coupled amplifiers, FET's in input circuits and smart compact construction.

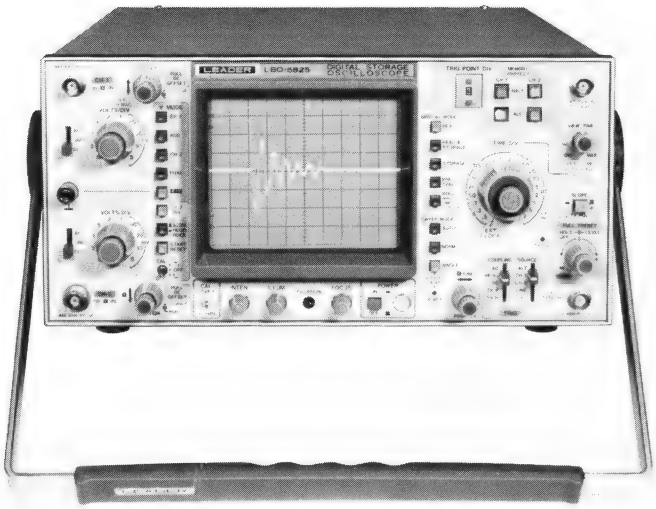
■ SPECIFICATIONS

MODEL	LBO-512B	LBO-510B	LBO-310A
CRT Display			
Type	130BXB31, 8x10div (1div = 10mm)	130BHB1, 8x10div (1div = 10mm)	C3S49P1, 8x10div (1dv = 6mm)
Acceleration Voltage	Approx. 1350V	Approx. 1500V	Approx. 1200V
Intensity Modulation	20Vp-p or more	30Vp-p or more	
Vertical Amplifier Sensitivity	10mV/div, 100mV/div, 1V/div, 10V/div in 4 steps, Variable control (10mV/div~100V/div) Accuracy: ±5%	20mVp-p/div or more	
Bandwidth	DC (2Hz) ~ 10MHz, –3dB	DC (2Hz) ~ 4MHz, –3dB	
Rise Time	35ns	Input Control: x1, x10, x100 and fine adjuster	
Time Base (Sweep Speed)	1ms/div, 0.1ms/div, 10μs/div, 1μs/div in 4 steps Variable control (10ms/div~1μs/div)	10Hz~100kHz, 4 steps with fine adjuster and line sweep	10Hz~100kHz, 4 steps with fine adjuster
Synchronization			
Mode	Automatic (with level control knob)	———	———
Signal Source	Internal (INT.), External (EXT.) + or –		
Sensitivity	INT. 10Hz ~ 10MHz at 1 div EXT. 10Hz ~ 10MHz at 1Vp-p	Internal (+ & –), External, Line Internal 1.5 div, vertical amplitude External, over 1Vp-p	Internal with negative peak 1 div signal amplitude, automatic
Horizontal Amplitude Sensitivity	Approx. 200mV/div Variable Control (200mV/div~10V/div)	300mVp-p/div or better	300mVp-p/div
Bandwidth	DC~250kHz, –3dB (H. Gain Max.)	DC~250kHz, –3dB	
Direct CRT Connection	———	———	(Y axis only) Sensitivity 10Vp-p/div, Bandwidth 100Hz ~ 450MHz
Calibration	Square wave (mains frequency) 0.5Vp-p ±3%	Sine wave (mains frequency) 0.1Vp-p	———
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 15VA	AC100, 120, 220, 240V, 50/60Hz, 20VA	AC100, 120, 220, 240V, 50/60Hz, approx. 12VA
Size and Weight	250(W)x175(H)x375(D)mm, 7.2kg	250(W)x175(H)x375(D)mm, approx. 7kg	125(W)x180(H)x300(D)mm, approx. 4kg
Accessories	Direct/Low capacitance probe LP-16BY ..1 Test leads (three per set) 1	Test leads (three per set) 1	———

Oscilloscope

DIGITAL STORAGE OSCILLOSCOPE

LBO-5825



Sampling Rate : 5MHz
Real Mode : 35MHz 5mV/div

The LBO-5825 is a storage oscilloscope with a 6-inch high-brightness, rectangular, metal-back CRT that provides a digital storage function (effective frequency bandwidth of 500 kHz) and a normal high-sensitivity wide bandwidth (5 mV/div, 35 MHz/500 μV/div, 5 MHz).

The rectangular CRT with an internal graticule, coupled with a regulated high-accelerating voltage power supply, obtains accurate measurement free from reading errors.

Extensive use of custom ICs provides enhanced stability and reliability.

The panel design of a separately-arranged vertical and horizontal amplifier controls both sides of the CRT, together with colored trigger and storage units, enables simple panel operations.

Storage Mode Features

Separate memories are provided for CH-1 and CH-2 to permit simultaneous writing of signals and to eliminate time differences between channels.

ADD and CH-2 polarity selections make it possible to observe the sum of or difference between two stored signals, and to also display an accurate picture of push-pull signals.

In the REAL & STORAGE mode, the storage waveform and current waveform can be concurrently displayed for easy comparison.

The two separate channel memories permit storage and concurrent display of two waveforms each, for a total of four waveformes. With the addition of real-mode waveforms, a total of six waveforms can be concurrently displayed.

The stored waveforms are protected in case of power failure by a built-in battery over a long time (two weeks or more).

Waveforms can be plotted by using an X-Y pen recorder.

Input & output of memory data to external instruments (such as personal computer) are available through digital I/O terminal.

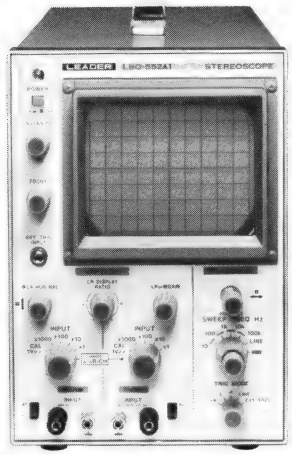
■ SPECIFICATIONS

CRT Display				
Type	150mm rectangular, Metal back, Internal-graticule scale			
Accelerating Voltage	7kV/2kV (P.D.A)			
Effective Display Area	8 x 10 div (1div = 10mm)			
REAL MODE				
Vertical Amplifier	CH-1 and CH-2			
Sensitivity	5mV/div~5V/div (35MHz), 0.5mV/div~2mV/div (5MHz: MAG x 10 ON) 1-2-5 sequence, 10 steps, and continuous adjuster			
Calibration Accuracy	±3% (±5%: MAG x 10 ON)			
Bandwidth	DC~35 MHz (REF. 8 div), −3dB: DC~5 MHz (REF. 8 div), −3dB (MAG x 10 ON) AC Coupling: 10Hz, − 3dB			
Input Impedance	1MΩ ± 1.5%, 25pF ± 5pF			
Display Modes	CH-1, CH-2, ADD DUAL CHOP: 0.5 s/div~ 1ms/div ALT: 0.5 ms/div~0.2μs/div X-Y CH-1 ... X axis, CH-2 ... Y axis			
CH-1 Output	Approx. 50mV/div into 50Ω DC ~ 35 MHz, −3dB			
Horizontal Amplifier				
Sweep Method	Trigger sweep, Automatic trigger sweep, Single sweep			
Sweep Time	0.2 μs/div ~ 0.5s/div, 1-2-5 sequence 20 steps and continuous adjuster			
Calibration Accuracy	± 3%			
Magnifier	X 10±5% (±10% for 0.2 μs/div)			
Max. Sweep Time	20ns/div (MAG x 10 ON)			
Hold-off Variable	One sweep or more			
Synchronization				
Signal Source	ALT, CH-1, CH-2, LINE, EXT			
Coupling	AC, DC, HF-REJ, TV-V, TV-H			
Sensitivity		Band width	INT.	EXT.
	NORM	DC~10MHz	0.5div	0.2Vp-p
		DC~35MHz	1.5div	0.6Vp-p
	AUTO	30Hz~10MHz	0.5div	0.2Vp-p
		30Hz~35MHz	1.5div	0.6Vp-p
TV Synchronization	Synchronizing composite video signal			
X-Y Mode				
Sensitivity	Same at vertical amplifier			
X-axis Bandwidth	DC or 10Hz~1MHz (REF. 8 div), −3dB			
X-Y Phase	Less than 3° at 100 kHz			
STORAGE MODE				
Storage capacity	1,024 words x 2 channels (1 word = 8 bits) Battery backup assures two weeks or more			
Vertical Amplifier	(CH-1 and CH-2)			
Sensitivity	5mV/div~5V/div			
Resolution	8 bits (1/256)			
Max. Conversion Speed	200 ns/word			
Horizontal Amplifier				
Resolution	10 bits (1/1024)			
Writing Speed	INT: STORAGE/PRETRIG; 20μs div~0.5S /div (0.2μs/word to 5ms/word) ROLL: 2ms/div~50s/div (20μs/word~0.5s/word) EXT: CLOCK frequency less than 5MHz TTL, Negative edge			
Reading Speed		SCOPE	RECORDER	
	READ TIME PUSH FIXED	0.5ms/div (5μs/word)	5s/div (50ms/word)	
	READ TIME PLL TIME/div	TIME/div setting (20μs/div~0.5s/div)or EXT CLOCK	100 times the TIME/div setting (2ms/div~50s/div) or EXT CLOCK (demultiplied by 1/100)	
Display Modes	REAL & STORAGE, STORAGE, PRE-TRIG, ROLL			
VIEW TIME	Off or variable (approx. 0.5~5s)			
Memory Protection	Can be set, separately for each channel			
Recorder Output	(SCOPE mode, no output)			
Vertical	(CH-1 and CH-2) 0.5V/div, 2V~−2V			
Horizontal	0.5V/div, 2.5V~−2.5V			
Pen	TTL level (lifted when high)			
Calibration Signal	Available for output			
Digital I/O Terminal	TTL level, 40 pin, connector			
Calibrator	Output Voltage: 0.5Vp-p ± 1%			
Power Supply	100, 120, 200, 220, 240V (Selectable by rewiring) approx. 80W			
Size and Weight	145(H) x 305(W) x 400(D)mm, 10 kg			

Stereoscope

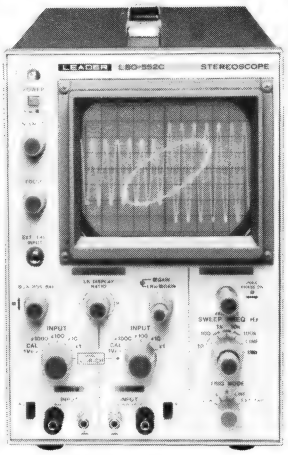
10MHz STEREOSCOPES (Triggered)

LBO-552A1



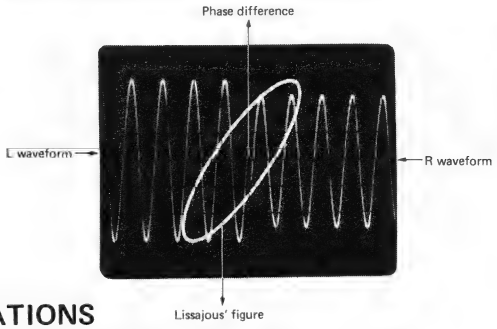
20mV, X–Y Operation is available

LBO-552C



20mV, Lissajous' figure

Amplitude and phase difference are observed by L.R. waveform display and Lissajous' figure is simultaneously shown in the center. (LBO-552C)



Here is a 130mm (5") scope specially adapted for observing waveforms in stereo circuits. It is a dual-trace type in which two waveforms, left and right signal, are displayed side by side. This feature permits instant comparison of amplitudes and phase for balance adjustments. Indispensable when checking stereo equipment tape-recorders, amplifiers, receivers in manufacturing plants and in service shops.

■ FEATURES

- Two input signals in the same range can be adjusted with a common gain control. Moreover, the same control is effective for two signals with different amplitudes.
- The L and R waveforms will always be jointed together with very small separation in the display. Thus, azimuth adjustments of the magnetic head in a tape recorder can be easily performed.
- Close inspection can be made for L and R inputs by "sliding" the waveforms to either side.
- X-Y operation requires only one switch setting; no tedious reconnections and switching operations are needed. The phase difference is very low between the two axes. Useful in phasing the pilot and subcarrier signals, etc.
- Can be used as a high-grade general purpose scope with two channel inputs.
- Automatic synchronization of the triggered sweep is possible from different sources, internal, external, etc.
- Robust construction, using a diecast frames.
- The waveform to be measured automatically stays static, since the trigger sweep circuit is employed.
- Parasitic oscillation such as of an audio amplifier can be readily observed, because the vertical axis has a wide band width of 10MHz.
- A clear trace image is available without intensity sag by the use of DC blanking circuit.

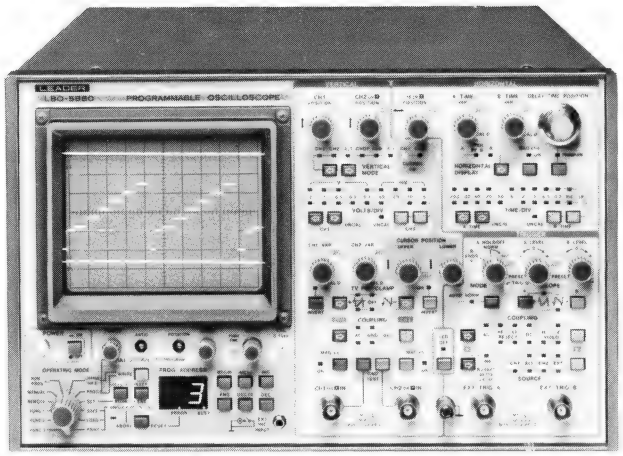
■ SPECIFICATIONS

Vertical Amplifiers for L and R Inputs	
Sensitivity	20mVp-p/div, or better; balancing error for both ch. within 3%.
Bandwidth	DC: DC ~ 10MHz. at –3dB AC: 2Hz ~ 10MHz. at –3dB
Input Impedance Input Control	1MΩ: less than 44pF in shunt. Four ranges: x1, x10, x100, x1000; separate or ganged, with common fine adjuster.
Waveform Switching	Left and right at respective sides on a common base line.
Calibrating Voltage	0.1Vp-p at mains frequency.
Time Base	
Sweep Frequency	Triggered sweep: 10Hz ~ 100kHz in four ranges, external and line.
Synchronization	L+R, L, R, LINE, and EXT. TRIG. automatic type.
X-Y Operation	
X-Axis Sensitivity Input Control	20mVp-p/div or better, Four ranges, same as for the R channel.
Bandwidth	DC: DC~1MHz at –3dB AC: 2Hz ~ 1MHz at –3dB
Phase Angle	Less than 2 deg. below 20kHz; less than 8 deg. to 100kHz
Calibrating Voltage	0.1Vp-p at mains frequency
Cathode Ray Tube	130mm type: 130BXB31; accelerating voltage, approx. 1.35kV; Display area, 8 x 10cm effective.
Power Supply	AC100, 120, 220, 240V 50/60Hz; approx. 20W
Size and Weight	175(W) x 248(H) x 380(D) mm; approx. 7.2kg

Oscilloscope

PROGRAMMABLE OSCILLOSCOPE

LBO-5880



NEW

30MHz/5mV (1mV)

- The memory addresses are organized into 100 steps, numbered from 0 to 99. The stored program is protected by a battery backup.
- The BEGIN and END addresses can be freely set from address 0 to address 99, so that the program stored within this range can be recalled for use in a product tuning line, for example, as often as desired.
- Programmed data can be transferred to another LBO-5880 (SAVE) or data can be received from another LBO-5880 (LOAD).
- Program insertion, deletion and exchanging are provided as memory editing functions to simplify program editing to meet changing process requirements.
- All oscilloscope functions including variable controls are programmable with the exception of focus, astigmatism, rotation and illumination.
- Whenever an operator error occurs, the corresponding error number is displayed to alert the operator. In this way, continued use of the oscilloscope will be inhibited until the error is recovered.
- Program contents can be printed on an external printer.
- As a 64-bit (8 bits x 8) external memory is provided and simple external circuit is installed, the 64 bits can be externally controlled.
- Since the oscilloscope functions can be selected by transmitting data from an external controller (such as a microcomputer), the LBO-5880 can be totally operated as a remote-controlled oscilloscope (including variable controls.)
- Hardware self-diagnostics simplifies the process of checking for internal errors.
- Memory write protection prevents inadvertent deletion of important programs.

■ SPECIFICATIONS

Oscilloscope Section

CRT Display
- Type: 150mm rectangular, Internal-graticule, Metal back
- Acceleration Voltage: 7kV/2kV regulated • Effective Display Area: 8 x 10 div (1 div = 10mm)

Vertical Amplifier Sensitivity	(for both CH-1 and CH-2) 5mV/div~2V/div (30MHz), 1mV/div (20MHz: MAG x 5 ON), 1-2-5 sequence, 9 steps, and continuous adjuster
Frequency Characteristics	DC (10Hz) ~ 30MHz, –3dB (MAG x 5: DC~20MHz)
Display Modes	CH-1, CH-2, ALT, CHOP, ADD, X-Y, CH-1 CURSOR ON, CH-2 CURSOR ON
Polarity Invert	CH-1 INVERT, CH-2 INVERT
Cursors	Upper and lower cursors (Only one trace can be viewed while cursors are displayed.)
Pedestal Clamps of Composite Video Signal	+ Clamp: Clamped to + sync waveform pedestals. — Clamp: Clamped to — sync waveform pedestals.
Horizontal Amplifier Sweep Method	Trigger sweep, Automatic trigger sweep, Continuous delayed sweep, and Trigger delayed sweep
Sweep Time	A sweep, B sweep 0.2μs/div~200ms/div, 1-2-5 sequence, 19 steps, and continuous adjuster
Hold-off Variable Magnifier	One sweep or more x10±5%, Max. Sweep Time: 20ns/div (MAGx10)
Synchronization Signal Source A Signal Source B	LINE, CH-1, ALT, CH-2 and EXT. B START AFTER DELAY, CH-1, ALT, CH-2 and EXT.
Coupling A, B	AC, HF-REJECT, LF-REJECT, DC, VIDEO H and VIDEO V
TV synchronization	Synchronizing composite video signals. The slope switch is selected according to video singal polarity.

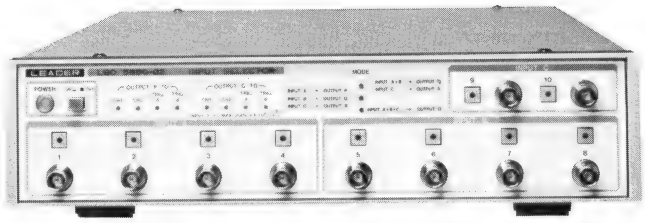
Memory Section

Program Address	0~99 (100 addresses)
Internal Memories	2,048 words by 8 bits static CMOS RAM x 5 (Program backup, four, 8K bytes / Internal system, one, 2K bytes)
Built in battery	NiCd backup battery, 3.6V Provides one-month's memory backup when fully charged at 90mAh.
Address Display	7-segment two-digit LEDs display addresses 0~99.
Operating Mode SET	BEGIN and END address setting, setting/resetting of memory write protection
PROG	Program entry, insertion, deletion, exchanging, recall and sample program call
CHARGE VAR'S	Alteration of variable knob data
RUN PROG	Program call
MANUAL	Operation as an ordinary oscilloscope without using memory
REMOTE	Control by externally supplied address data
SAVE	Program transfer to another LBO-5880
LOAD	Program transfer from another LBO-5880
PRINT	Printing of program data on an external printer
FUNC 1	Automatic address incrementation
FUNC 2	External oscilloscope control and checking programs
FUNC 3	Checking programs and other options
Memory Function	Can be memorized for all switch modes (except memory control SW, GND TEST SW and LED OFF SW), CH-1 POS, CH-2 POS, H POS, A TIME VAR, B TIME VAR, DELAY TIME POSITION, CH-1 VAR, CH-2 VAR, UPPER CURSOR, LOWER CURSOR, A HOLD OFF, A LEVEL, B LEVEL, INTEN, Each variable knobs data has resolution 1024 (10 bits).
External Connectors I/O bus	24 pins, external device control (An additional circuit is required: 8 bits x 8, 64 bits maximum) Probe selector (LBO-5880-02)
I/O port	37 pins, program transfer, address output, address input (address control), oscilloscope control by external data
Printer	14 pins, program data printing (on a Centronix compatible printer)
Power Supply Size and Weight Accessories	AC100, 117, 220, 240V, 85W 320(W) x 200(H) x 400(D) mm, 11kg Fuse 1

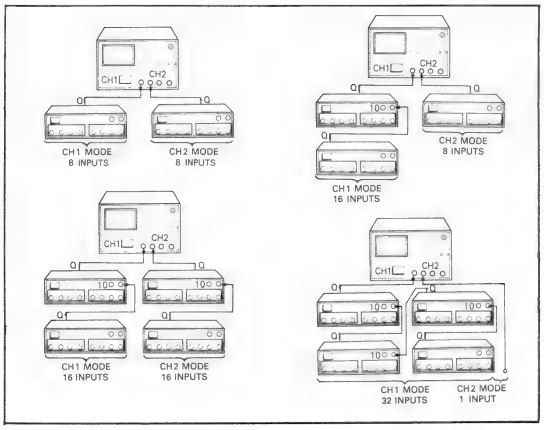
Oscilloscope

■ LBO-5880-02

LBO-5880-02 is an input selector to be used in combination with LBO-5880 Oscilloscope.



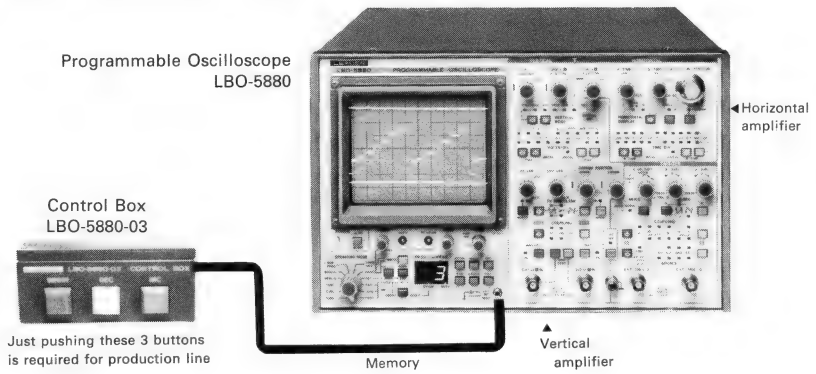
■ Expansion Cabling



■ SPECIFICATIONS

Number of Inputs to be Selected	Input A . . . 4 pcs., Input B . . . 4 pcs., Input C . . . 2 pcs.,
Number of Outputs to be Selected	Output P . . . 1 pc., Output Q . . . 1 pc., Output R . . . 1 pc.
Input-Output Selection Modes	Mode 1. {input A + input B → output Q; input C → output R} Mode 2. {input A → output P; input B → output Q; input C → output R} Mode 3. input A + input B + input C → output Q Maximum number of units which can be connected: up to 4 units.
Output Mode Setting	Output P and Q to CH-1, CH-2, TRIG A or TRIG B
Input Impedance Input A and B	1MΩ, 40pF typ
Input C	Depends on the load requirements of output R to which the input is connected for direct relay switchover.
Input Connector Input Coupling	BNC AC/GND/DC only for inputs A and B
Input Attenuator	1/1, 1/10, 1/100, 1/2.5 and 1/5 But the attenuator is automatically selected to match the VOLTS/DIV setting of the oscilloscope.
Frequency Response	DC to 30MHz, −3dB for an output of LBO-5880-02 DC to 20MHz, −3dB when LBO-5880 and LBO-5880-02 are combined.
Transfer Gain	1.0±3% Input attenuation: 1/1, output termination: 50Ω
Max. Allowable Input Voltage Output Impedance	200V (p-p + DC) 50Ω typ.
Ambient Temperature for Operation: 0 to +40 deg. C (humidity: less than 85%) Ambient Temperature for Guaranteed Specification: +15 to +35 deg. C	
Power Supply AC OUTLET Size and Weight	AC100V (The equipment can also be changed for 120V, 200V, 220V and 240V by reconnection.) Up to 200VA 320(W) x 75(H) x 400(D) mm, 7kg
Accessories	Bus cable, 24-pin, 1m . . . . . 1 Rush current proof fuse for 100-120V, 0.5A . . 1 (for 200-240V, 0.25A) BNC-BNC cable 50Ω, 3D2D, 1m . . . . . 2 Through terminator 50Ω 2

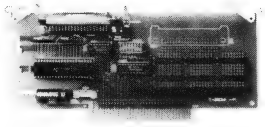
The INC, DEC, and BEGIN functions can be remote-controlled by attaching the LBO-5880-03 (optional control box to the front panel EXT INC INPUT jack).



■ Optional Accessories for Programmable Oscilloscope

PPI 8255 I/O CARD

LC-2330



Transfer cable

LC-2066

2m

Printer cable

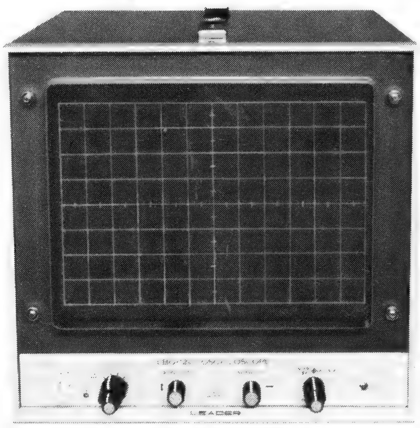
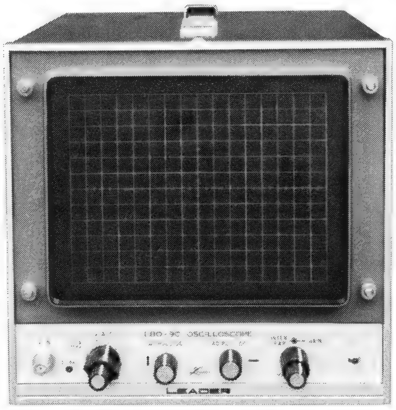
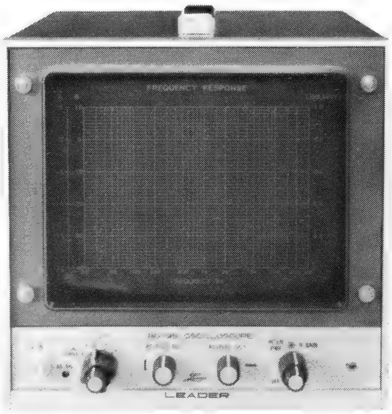
LC-2065

1.5m

■ PROBE

Low Capacitance	High Impedance	High Impedance	BNC ~ BNC	Demodulator
LP-16BX	LP-17AX	LP-012X	LP-010	LP-7X

Alignment Scope

310mm ALIGNMENT SCOPE	230mm ALIGNMENT SCOPE	LONG PERSISTENT PHOSPHOR ALIGNMENT SCOPE
LBO-12C	**LBO-9C**	**LBO-9S**
		

2mV / 10kHz

The LBO-12C is an alignment oscilloscope equipped with a large 12-inch screen for easy reading. The LBO-9C is an alignment oscilloscope equipped with a large 9-inch screen. Both models use the sweep generator to observe band characteristics of TV receiver signals, radio receiver signals, and filters.

- Large CRT display screen provides easy reading.
- DC amplifiers for both vertical and horizontal deflections.
- Illumination marker for easy reading at high sensitivity.

The LBO-9S is designed for monitoring frequency response to be used in combination with the LFR-5600 series or LFG-1300. This model uses a CRT with long-persistent phosphor and has a logarithmic scale displayed in orange on the screen.

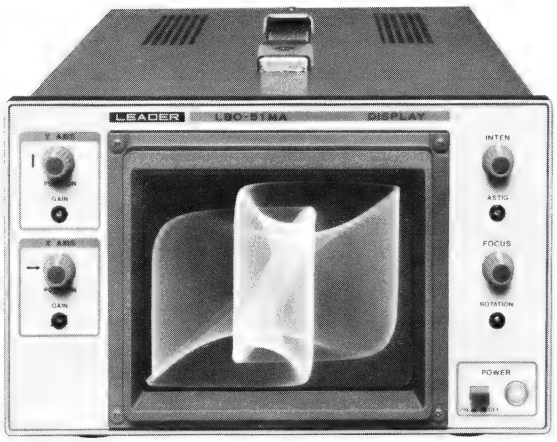
■ SPECIFICATIONS

MODEL	LBO-12C	LBO-9C	LBO-9S
CRT Effective Display Area	310CFB4A 12div x 8div (1div=2cm)	230MB4A 16div x 12div (1div=1cm)	230MB7 140 x 100mm logarithmic scale
Vertical Amplifier Sensitivity Bandwidth Input Impedance Input Attenuator Calibration Voltage Max. Input Voltage	 2mVp-p/div or better DC (2Hz) ~ 10kHz (−3dB) 1MΩ50pF in shunt x1, x10, x100 and fine adjuster 0.02Vp-p, square wave at line freq. 50V (DC + ACp-p)	 2mVp-p/div or better DC (2Hz) ~ 10kHz (−3dB) 1MΩ50pF in shunt x1, x10, x100 and fine adjuster 0.02Vp-p, square wave at line freq. 50V (DC + ACp-p)	 2mVp-p/div or better DC (2Hz) ~ 10kHz (−3dB) 1MΩ50pF in shunt x1, x10, x100 and fine adjuster 0.02Vp-p, square wave at line freq. 50V (DC + ACp-p)
Horizontal Amplifier Sensitivity Bandwidth Input Impedance Input Attenuator Max. Input Voltage	 100mVp-p/div or better DC (2Hz) ~ 1kHz (−3dB) 500kΩ, 50pF in shunt Fine adjuster 50V (DC + ACp-p)	 100mVp-p/div or better DC (2Hz) ~ 1kHz (−3dB) 500kΩ, 50pF in shunt Fine adjuster 50V (DC + ACp-p)	 100mVp-p/div or better DC (2Hz) ~ 1kHz (−3dB) 500kΩ, 50pF in shunt Fine adjuster 50V (DC + ACp-p)
Intensity (Z-axis) Sensitivity	 Input over 2Vp-p, adjustable	 Input over 2Vp-p, adjustable	 Input over 2Vp-p, adjustable
Pulse Marker Input Sensitivity Polarity Input Impedance	 2Vp-p/div or better, adjustable — or + , switchable 100kΩ	 2Vp-p/div or better, adjustable — or +, switchable 100kΩ	 2Vp-p/div or better, adjustable — or +, switchable 100kΩ
Power Supply Size and Weight	AC100, 120, 220, 240V 320(W) x 300(H) x 280(D)mm, 10kg	AC100, 120, 220, 240V 240(W) x 230(H) x 280(D)mm, 9.5kg	AC100, 120, 220, 240V 240(W) x 230(H) x 280(D)mm, 9.5kg
Accessory	BNC ~ BNC cable 1	BNC ~ BNC cable 1	BNC ~ BNC cable 1

Oscilloscope

X–Y DISPLAY

LBO-51MA



X·Y-Axis 3MHz, Z-Axis 4MHz

The purpose for developing the LBO-51MA, with a post-acceleration 150mm rectangular CRT, is to provide a display which can be used independently and is most adapted for OEM uses. Its 3MHz X·Y Axis bandwidth and 4MHz Z-Axis bandwidth allow applications as instrument to display response curve, spectrum and oscillation analysis, etc.

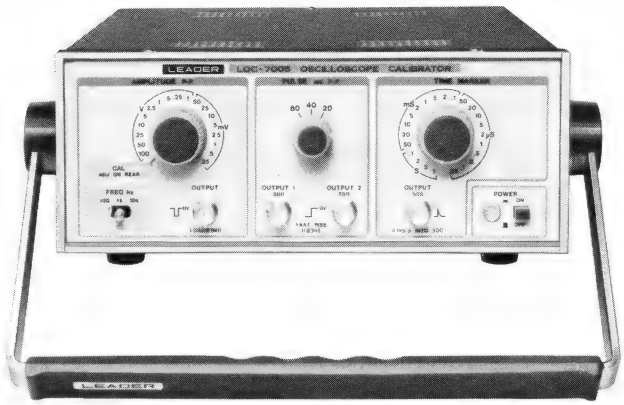
- X-Y Phase Difference is less than 3° at 1MHz.
- Besides its independent use, its ½ rack size offers convenience for being mounted into various systems.
- CRT Fluorescent Screen, X·Y Axis Sensitivity, Z-Axis polarity, etc. are optionally available.

■ SPECIFICATIONS

CRT Display	
Type	150mm, Rectangular, post-acceleration
Effective Display Area	8 x 10 div (1 div=10mm)
Acceleration Voltage	7kV/2kV Stabilized
X · Y Axis	
Deflection Sensitivity	Adjustable between 50mV ~ 150mV/div with gain control on front panel. 50mV/div ±3% (1 div=10mm) set at time of shipment.
Frequency Response	DC (2Hz) ~ 3MHz −3dB
Input Coupling	DC/AC Internally switchable (Shipped in DC setting)
X-Y Phase Difference	Less than 3° at 1MHz
Rise Time	Less than 120 ns
Polarity	Beam shifts upwards (Y-Axis) and to the right (X-Axis) at positive input, reversible with internal switch.
Linearity	Less than 5%
Input Impedance	1MΩ ±2%, Less than 50pF
Input Voltage	100V (DC + ACp-p)
Z Axis (Intensity)	
Input Voltage	Maximum intensity at +1V and blanked at −1V when intensity knob positions at center
Frequency Response	DC ~ 4MHz −3dB
Rise Time	Less than 90 ns
Input Impedance	1MΩ ±2%, Less than 50pF
Max. Input	100V (DC + ACp-p)
Optional	CRT Fluorescent Screen, CRT Internal Graticule, X·Y Axis Sensitivity, X·Y·Z Input Resistance (50Ω), Z-Axis Polarity, Z-Axis TTL Input.
Power Supply	AC 100, 120, 220, 240V, 50/60Hz, 35W
Size and Weight	215(W) x 132(H) x 422(D)mm, 6kg
Accessory	CRT Filter Plate (without scale) Fuse (0.8A)

OSCILLOSCOPE CALIBRATOR

LOC-7005



5div Constant Amplitude Display Calibration

The LOC-7005 is a signal generator to calibrate vertical axis and time axis of oscilloscope. It generates 0.25mV ~ 100V ±0.5% square wave for calibration of Vertical Axis Voltage Sensitivity. Its output step sequence has been set at 1-2.5-5, generally providing a 5 div display on a 1-2-5 step input switching oscilloscope and prevents miscalibration. Low Vertical Axis, Medium Speed Response can also be inspected because the frequency can be switched from 100Hz to 1kHz and 10kHz. It also generates high speed square waveforms of less than 3ns rise for calibration of High Speed Response.

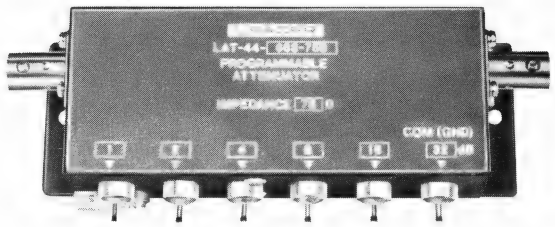
■ SPECIFICATIONS

Voltage Calibration	
Output Voltage (p-p)	0.25mV ~ 100V, 1-2.5-5 Step 18 Ranges switchable, Negative Pol.
Amplitude Accuracy	±0.5%, >1MΩ load
Frequency	100Hz, 1kHz, 10kHz ±5% 3 Ranges switchable
Output Waveform	Symmetrical square wave
Rise Time	Within 500 ns
Output Resistance	Less than 2kΩ
Time Calibration	
Pulse Marker Sequence	0.05 μs ~ 1 sec 1-2-5 Step 23 ranges switchable
Time Accuracy	Within 0.05%
Output Voltage (p-p)	More than 0.1V (with 50Ω terminator)
Output Waveform	Differential Positive Pulse
High Speed Square Wave	
Output Waveform	Symmetrical Square Wave, Positive Pol.
Frequency	100kHz
Rise Time	Less than 3 ns
Output Voltage (p-p)	20mV, 40mV, 80mV, ±5% 3 Ranges switchable(with 50Ω terminator)
Output Terminal	2 pcs. isolated each other
Temperature Range for Specified Accuracy	Temperature Humidity +10 ~ +35°C (Less than 80%)
Power Supply	AC 100,120, 220, 240V, 50/60Hz Approx. 30VA
Size and Weight	250(W) x 99(H) x 300(D)mm, 4kg
Accessories	BNC ~ BNC cable (3C2V ... 1, 3D2V ... 2) 50Ω terminator (LT-2049) ... 2 Accessory bag (LP-2012) ... 1

Transistor Checker

PROGRAMMABLE ATTENUATOR

LAT-44



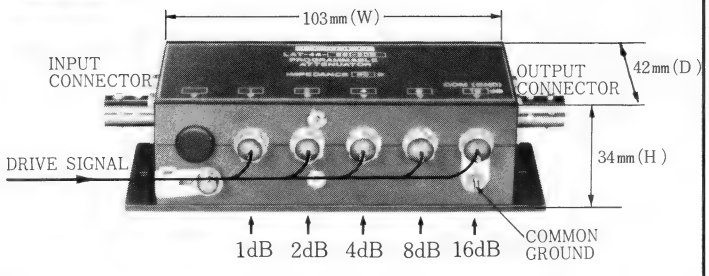
1~10dB (1dB Step), 16dB, 20dB, 30dB, 32dB

LAT-44 is a 1~6 section, programmable attenuator that can be used for up to DC~1 GHz (50Ω) and DC~500 MHz (75Ω). Since the instrument can be controlled by external signals, it is useful for the automatic or remote control of the signal level for a variety of instruments and jigs.
The operating frequency ranges are very large and up to DC~1 GHz (50Ω) and DC~500 MHz (75Ω).

■ SPECIFICATIONS

	50Ω	75Ω
Frequency Range	DC ~ 1GHz	DC ~ 500MHz
Characteristic Impedance	50Ω	75Ω
Input/Output Connector	BNC-R, (or N-R)	BNC-R-75 (or NC-R)
Insertion Loss	0.5dB/1 section or less	0.3dB/1 section or less
Kinds of Attenuation	1 ~ 10dB(1dB step), 16dB, 20dB, 30dB, 32dB	
Maximum Attenuation	70dB	
Number of Attenuation's Section	1 ~ 6 section	
Attenuation Error	Within ± (2% + 0.2)dB	
VSWR	1.25 or less	
Input Power	0.1W or less	
Control Power Supply	Common ground, + 12V approx. 30mA (one section each)	
Size and Weight		
1, 2 section	39(W) x 34(H) x 42(D) mm, 150 g	
3, 4 section	71(W) x 34(H) x 42(D) mm, 240 g	
5, 6 section	103(W) x 34(H) x 42(D) mm, 320 g	
Operating Time	10 million times (TYP.)	
Switching Time	4ms or less	

Example



CURVE TRACER

LTC-905

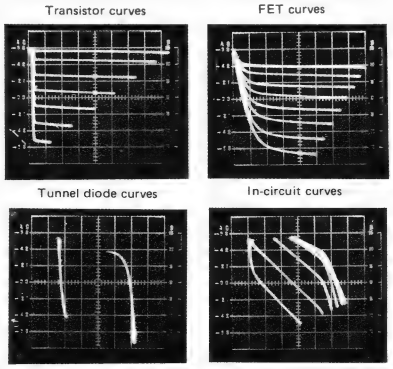
Characteristics Curves on Scope

Curve tracing on a scope is made easy with the LTC-905. Characteristics curves of all types of semiconductors can be accurately displayed. This is far superior to the conventional ohmmeter checks for quality. In-circuit testing is possible for quick checks. Two inputs are provided to enable comparison of two similar units.
LTC-905 is designed to test the following:

- Transistors NPN, PNP, FET and MOS FET.
- SCR's (Thyristors) Triacs and Diode.

■ SPECIFICATIONS

Collector/Drain Sweep	
Frequency	120Hz, or 100Hz (2 x power frequency)
Voltage	8 steps: 10, 20, 30, 40, 50, 60, 80 and 100V; accuracy, ±10%
Sweep Waveform	Full wave rectified waveform
Current	100mA, maximum
Current Limiter	1000Ω for low level transistors; 100Ω for power transistors
Step Generator	
No. of Steps	7
Current per Step	10, 20, 50μA, 0.1, 0.2, 0.5, 1, 2mA; accuracy, ±5%
Volt per Step	0.1, 0.2, 0.5V; accuracy, ±5%
External Bias	One curve display
Power Supply	100, 120, 200, 220, or 240V, 50/60Hz; 25VA, maximum, operating, and 6VA at stand by
Size and Weight	240(W) x 90(H) x 170(D)mm; 2kg
Accessories	3-lead cable (banana plugs/clips) . . . . . 2 Scope leads, 2 red and 1 black . . . . . 1 set In-circuit test probe, LP-11 1



Multimeter

DIGITAL MULTIMETERS

LDM-852A

LDM-853A

4-½ Digit LED Display

The LDM-852A is a 4-½ digit bench type full scale multimeter capable of measuring AC/DC voltage/current and resistance in 24 ranges, equipped with the automatic polarity switching function, featuring a large type LED (green) display.

- Low/High resistance range selecting type. Buzzer continuity check is possible in 200Ω and 2kΩ ranges at High Ω (with the buzzer ON-OFF function).

3-½ Digit LED Display

The LDM-853A is a compact-size digital multimeter with a large LED to indicate 3-½ digit. It is applied to measure DCV, ACV, DCA, ACA, and Ω in 24 ranges selectable and is provided with automatic polarity switching and auto-zero adjustment functions.

- High current measurement up to 2A (DC/AC)
- Automatic polarity switching and auto-zero adjustment

■ SPECIFICATIONS

MODEL	LDM-852A	LDM-853A
Measurement Functions		
DC Voltage	0.2, 2, 20, 200, 1000V 5 ranges	0.2, 2, 20, 200, 1000V 5 ranges
AC Voltage	0.2, 2, 20, 200, 1000V 5 ranges	0.2, 2, 20, 200, 1000V 5 ranges
DC Current	2, 20, 200mA, 2A 4 ranges	2, 20, 200mA, 2A 4 ranges
AC Current	2, 20, 200mA, 2A 4 ranges	2, 20, 200mA, 2A 4 ranges
Resistance	0.2, 2, 20, 200, 2000kΩ, 20MΩ 6 ranges HI/LO	0.2, 2, 20, 200, 2000kΩ, 20MΩ 6 ranges
Measurement Accuracy		
DC Voltage	± 0.03% rdg ± 2 digit (2V)	± 0.3% rdg ± 2 digit (0.2 ~ 200V)
AC Current	± 0.3% rdg ± 10 digit (2V range: 40 Hz ~ 1 kHz)	± 0.5% rdg ± 4 digit (0.2 ~ 200V ranges: 45 ~ 1 kHz)
DC Current	± 0.4% rdg ± 2 digit (2 ~ 20mA)	± 0.4% rdg ± 3 digit (2mA range)
AC Current	± 0.6% rdg ± 10 digit (2 ~ 20mA)	± 1.8% rdg ± 4 digit (all ranges)
Resistance	± 0.03% rdg ± 4 digit (2 ~ 200kΩ) ... HI ± 0.15% rdg ± 2 digit (0.2 ~ 200kΩ) ... LO	± 0.3% rdg ± 2 digit (0.2 ~ 2000kΩ) ... LPΩ
Input Impedance	DCV, ACV ... 500MΩ/10MΩ	DCV ... 10MΩ, ACV ... 10MΩ
Maximum Input		
DC Voltage	1100V (DC + ACp-p)	1000V (DA + ACp-p)
AC Voltage	1100Vrms, 1100V DC	1000Vrms, 1000V DC
DC Current	±2A	± 2A
AC Current	2A	2A
Resistance	250V AC/DC	240V (DC + ACp-p), 240Vrms
Display	LED display, Max. 19999	LED display, Max. 1999
Range Switching	Manual	Manual
Overrange Indication	Display 0000 and flashing	Most significant digit "1" only
Polarity	Automatic ("—" indicates reverse polarity)	Automatic ("—" indicates reverse polarity)
Low Battery	"BATT LOW" will flash	"•" indicator (low voltage indicator)
Sampling Rate	2.5 times per second	Approx. twice per second
Electric Buzzer	Beep at less than 2Ω ± 1Ω	—
Environmental		
Storage Temperature	–20°C ~ +60°C	–20°C ~ +60°C
Temperature range	0° ~ 40°C	0° ~ 40°C
Humidity	Less than 85% RH	Less than 80% RH
Power Source	AC100, 120, 220, 240V, 50/60Hz	UM-2 or "C" cell x 4 (or AC adaptor)6V
Power Consumption	5VA (100V)	Approx. 200mW
Size and Weight	211(W) x 80(H) x 265(D) mm, 2.2 kg	160(W) x 58(H) x 122(D) mm, 500 g

Frequency Counter

DIGITAL FREQUENCY COUNTERS

LDC-822A

10Hz ~ 80MHz

LDC-823A

10Hz ~ 250MHz

LDC-824

10Hz ~ 520MHz

LDC-822A, 823A, 824 are digital frequency counters/timers designed to measure the frequency and period of a signal, featuring a wide frequency range (10Hz ~ 80MHz; LDC-822A), (10Hz ~ 250MHz; LDC-823A), (10Hz ~ 520MHz; LDC-824), a high input sensitivity (20 ~ 50mVrms), and high resolution to 7 ~ 8 digits.

The period function makes the unit outstanding for video tape recorder service applications. These instruments can be used for adjustment, test and repair of audio instruments, AM/FM radios, TVs, CB radios, amateur-radios, electronic watches, musical instruments, etc.

- A big bright fluorescent display assures easy readability of values. The green display does not induce eye fatigue even after an extended period of viewing.
- Misreadouts are reduced by zero-blanking, unit-display (kHz, MHz, mS) and overrange display.

■ SPECIFICATIONS

MODEL		LDC-822A	LDC-823A	LDC-824
Frequency Measurements Range		10Hz~80MHz	10Hz~80MHz (direct) 10Hz~250MHz (pre-scaler)	10Hz~80MHz (direct) 50MHz~520MHz (pre-scaler)
Gate Time		0.1S, 1S, 10S	0.1S, 1S, 10S	0.1S, 1S, 10S
Resolution		10Hz, 1Hz, 0.1Hz	10Hz, 1Hz, 0.1Hz (direct) 100Hz, 10Hz, 1Hz (pre-scaler)	10Hz, 1Hz, 0.1Hz (direct) 100Hz, 10Hz, 1Hz (pre-scaler)
Accuracy		±1 count ± time base accuracy	±1 count ± time base accuracy	±1 count ± time base accuracy
Period Measurements Range		100mS~1μS	100mS~1μS	100mS~1μS
Multiplication Factors		x10, x100, x1000	x10, x100, x1000	x10, x100, x1000
Resolution		10μS, 1μS, 0.1μS	10μS, 1μS, 0.1μS	10μS, 1μS, 0.1μS
Accuracy		±1 count ± time base accuracy ± trigger error		
Input Section				
Input Sensitivity	1MΩ	20mVrms, 200mVrms, 2Vrms (10Hz~80MHz)	50mVrms: 10Hz~100Hz 20mVrms: 100Hz~100MHz 50mVrms: 100MHz~250MHz	20mVrms: 10Hz~80MHz 50mVrms: 80MHz~520MHz
	50Ω		20mVrms: 100kHz~100MHz 50mVrms: 100MHz~250MHz	20mVrms: 100kHz~80MHz 50mVrms: 80MHz~520MHz
Input Impedance		Approx. 1MΩ	Switchable 1MΩ and 50Ω	Switchable 1MΩ and 50Ω
Attenuator		1, 1/10, 1/100	1, 1/10	1, 1/10
Max. Input Voltage	1MΩ	100Vrms: 10Hz~400Hz 20Vrms: 400Hz~100kHz 5Vrms: 100kHz~80MHz	100Vrms: 10Hz~400Hz 20Vrms: 400Hz~100kHz 5Vrms: 100kHz~250MHz	100Vrms: 10Hz~400Hz 20Vrms: 400Hz~100kHz 5Vrms: 100kHz~520MHz
	50Ω		5Vrms: 10Hz~250MHz	5Vrms: 100kHz~520MHz
Time Base Frequency		10MHz (crystal controlled)	10MHz (crystal controlled)	10MHz (crystal controlled) (oven)
Accuracy		±5x10^{-6} (32°F~104°F) (0°C~40°C)	±5x10^{-6} (32°F~104°F) (0°C~40°C)	±1x10^{-6} (32°F~104°F) (0°C~40°C)
Display		7 digits, 7 segment fluorescent display overflow indication, gate indication and zero blanking.	8 digits, 7 segment fluorescent display overflow indication, gate indication and zero blanking.	8 digits, 7 segment fluorescent display overflow indication, gate indication and zero blanking.
Power Supply		AC 100, 120, 220, 240V	AC 100, 120, 220, 240V	AC 100, 120, 220, 240V
Size and Weight		210(W) x80(H)x265(D)mm, 2.2kg	210(W)x80(H)x265(D)mm, 2.2kg	210(W)x80(H)x265(D)mm, 2.2kg
Accessories		Clip cable with BNC connector . . . 1	Clip cable with BNC connector . . . 1	Clip cable with BNC connector . . . 1

Frequency Counter

DIGITAL FREQUENCY COUNTERS

LDC-825

10Hz~1000MHz

LDC-825 is a digital frequency counter/timer designed to measure the frequency and period of a signal, featuring a wide frequency range (10Hz ~ 1GHz), a high input sensitivity 20 m Vrms (10Hz ~ 80 MHz), 50 mVrms (50MHz ~ 1GHz), and high resolution to 8 digits. The period function makes the unit outstanding for video tape recorder service applications.
The LDC-825 is small and portable. A big fluorescent display assures easy readability of values.
This green display does not induce eye fatique even after an extended period of viewing.

■ SPECIFICATIONS

Freq. Measurement Range		10Hz ~ 80MHz (direct) 50MHz ~ 1000MHz (pre-scaler)
Gate Time		100 ms, 1s, 10s (direct) 0.04s, 0.4s, 4s (pre-scaler)
Resolution		10Hz, 1Hz, 0.1Hz (direct) 1000Hz, 100Hz, 10Hz (pre-scaler)
Accuracy		± 1 count ± time bace accuracy
Period Measurements Range Multiplication Factors Resolution Accuracy		100 ms ~ 1 μs X 10, X 100, X 1000 10 μs, 1μs, 0.1 μs ± 1 count ± time base accuracy ± trigger error
Input Section Input Sensitivity	1MΩ	20mVrms (10Hz ~ 80MHz)
	50Ω	50mVrms (50MHz ~ 1000MHz)
Attenuator Input Impedance		1, 1/10 (10Hz ~ 80MHz) 1MΩ approx. 10Hz ~ 80MHz 50 Ω only (50MHz ~ 1000MHz)
Maximum Input Voltage	1MΩ	10Hz~400Hz: 100Vrms 400Hz~100kHz: 20Vrms 100kHz~80MHz: 5Vrms
	50Ω	50MHz~1000MHz: 5Vrms
Time Base Frequency Accuracy Clock Out External Clock		1MHz crystal controlled (Oven) ± 3 X 10^{-8} (± 0.03ppm) (0~40°C) 1 Vp-p 1MHz 1 Vp-p ~ 10Vp-p 1MHz
Display		8 digits, 7 segment fluorescent display overflow indication, gate indication and zero blanking
Temperature Range Power Supply Size and Weight Accessory		0°C ~ 40°C AC 100, 120, 200, 240V, 50/60Hz, approx. 15VA 230(W) x 90(H) x 285(D)mm, 2.5kg BNC ~ BNC cable 1

LDC-831

5Hz~150MHz

The LDC-831 is a frequency counter designed in compact size but with excellent cost performance as well as high reliability.
The LDC-831 has a wide range of applications in measuring frequencies from 5 Hz to 150 MHz, covering audio, hum, AM/FM radio, TV-VIF, SIF and CHROMA bands. It is in palm size, weighing only 650 g, easy to carry and best suited for field services. The LDC-831 can be operated either by DC (continuously for about 4 hours by 4 UM-2 or "C" cell dry batteries) or AC using an external adaptor (separately available LPS-166).

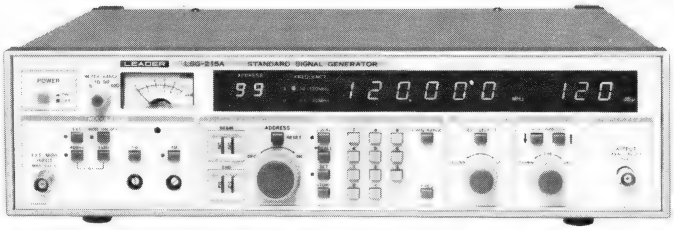
■ SPECIFICATIONS

Freq. Measurement Range Gate Time Resolution		5Hz to 150MHz 0.01S, 1S 2 Ranges kHz range (100Hz/1Hz) MHz range (10kHz/100Hz)
Accuracy Multiplication		± 1 count, ± reference time accuracy LOW range: 5Hz ~ 2MHz HIGH range: 1MHz ~ 150MHz
Input Sensitivity	LOW: 5Hz ~ 10Hz 1MHz ~ 2MHz	50mVrms
	10Hz ~ 1MHz	35mVrms
	HIGH: 1MHz ~ 2MHz 120MHz ~ 150MHz	50mVrms
	2MHz ~ 120MHz	30mVrms
Input Impedance Input Capacitance Max. Input Voltage		LOW: about 1MΩ, HIGH: about 2.5 kΩ LOW/HIGH: less than 15 pF 20Vp-p
Reference Time Frequency Reference Time Accuracy		3.2768MHz 5 X 10^{-5} (50 ppm), 0 ~ 40°C 1 X 10^{-5} (10 ppm), 23° ± 3°C
Counting Capacity Display Memory Indication		Decimal, 4½ digits indication Digit display (LED) Overflow indication
Operating Temperature & Relative Humidity		0°C ~ 40°C below 85%
Power Supply		Battery UM-2 or "C" cell x 4 (6V) Power consumption about 145 mA, Continuous operating time 4 Hr, AC adaptor (separately available)
Size and Weight Accessory		160(W)x 58(H)x 122(D)mm,approx. 650g BNC ~ clip cable 1

Signal Generator

STANDARD SIGNAL GENERATORS

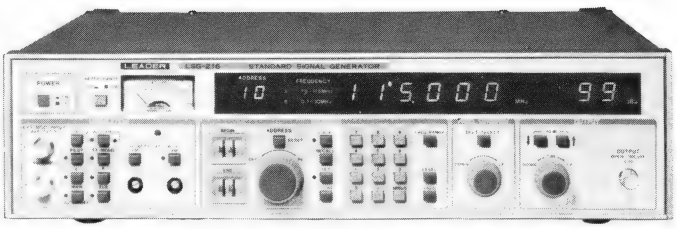
LSG-215A



0.1～30MHz, 30～120MHz, −10～120dBμ

- Highly stable signals are available as the oscillation signal is locked to the reference crystal oscillator.
- Output level can be set in a range of −10 to 120 dBμ [LSG-215A] −9 to 99 dB [LSG-216] (0 dB=1μV) in 1-dB step.
- Using an internal memory, which is backed up by battery, 100 points of selections combining frequency, modulation type, and output level can be stored.
- Frequency settings are available by ten-key operations.

LSG-216



0.1～30MHz, 75～115MHz, built-in FM Stereo Modulator

- The peak indication system is used for the meter circuit, and thus the composite signal can also be accurately indicated.
- Using a separately available memory, EPROM (2716 type), settings of predetermined frequencies for a service station or production line can be conveniently made.
- Remote control is available for the operations such as the memory call, using the 36-p connector on the rear panel.

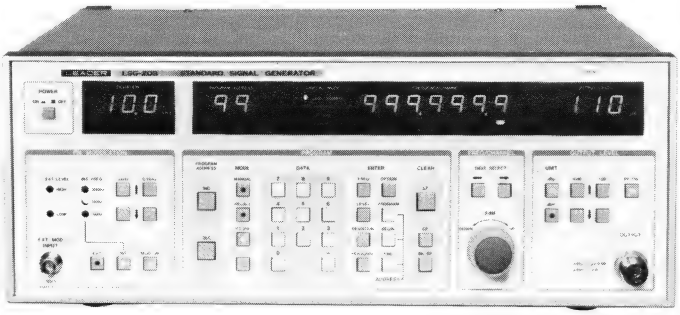
■ SPECIFICATIONS

MODEL	LSG−215A	LSG−216
Frequency Range	0.1 ~ 30MHz, 30 ~ 120MHz 2 ranges	0.1 ~ 30MHz 75 ~ 115MHz 2 ranges
Indication	6-digit digital indication	6-digit digital indication
Resolution	0.1 ~ 30MHz: 100Hz, 30 ~ 120MHz: 1kHz	0.1 ~ 30MHz: 100Hz, 75 ~ 115MHz: 1kHz
Accuracy, Drifiting	Within ± 5 x 10^{-5}, Within 5 x 10^{-5}	Within ± 5 x 10^{-5}, Within 5 x 10^{-5}
Maximum RF Output	120dBμ (0dB = 1μV, open circuit)	99dBμ (0dB = 1μV, open circuit)
RF Output Range	−10 ~ 120dBμ	−9 ~99dBμ
Output Indication	3-digit digital indication	2-digit digital indication
Output Accuracy	Within ± 1dB at 120dBμ output	Within ± 1dB at 99dBμ output
Attenuator Accuracy	Within ± 1.5dB (> 20dBμ),Within ±2dB (<20dB)	Within ±1.5dB (>0dB), Within ± 2dB (<0dB)
Output Impedance	50Ω Unbalanced, VSWR less than 1.2	50Ω Unbalanced, VSWR less than 1.2
Spurious Output	Less than−30dBc (more than 500kHz)	Less than−30dBc (more than 500kHz)
Residual Modulation (S/N)	(FM linear detector: demodulation band 80Hz ~ 20kHz)	
FM Component	More than 70dB in S/N for 75kHz deviation	More than 70dB in S/N for 75kHz deviation
AM Component	More than 50dB in S/N for 30% modulation rate	More than 50dB in S/N 30% modulation rate
Modulation		
Internal Modulation Freq.	400Hz, 1kHz (Accuracy: within ± 1%)	400Hz, 1kHz (Accuracy: within ±1%)
FM Modulation		
Frequency Range	1 ~ 30MHz, 30 ~ 120MHz	1 ~ 30MHz, 75 ~ 115MHz
Frequency Deviation	0 ~ 100kHz (higher than 1MHz in carrier)	0 ~ 100kHz (higher than 1MHz in carrier)
Deviation Indicator	5, 10, 50, 100kHz full scale	30kHz, 100kHz full scale
Indicator Error	1 ~ 120MHz: ± 10% of full scale	1 ~ 30MHz, 75 ~ 110MHz: ± 10% of full scale 110 ~ 115MHz: ± 20% of full scale
Distortion Rate	1 ~ 120MHz: less than 0.1%, 75 kHz deviation (Demodulation band 80Hz ~ 100kHz)	1 ~ 30MHz, 75 ~ 110MHz: less than 0.1% 75kHz dev. (Demodulation band 80Hz ~ 100kHz)
AM Modulation		
Frequency Range	0.1 ~ 30MHz, 30 ~ 120MHz	0.1 ~ 30MHz, 75 ~115MHz
Modulation Rate	0 ~ 50%	0 ~ 50%
Modulation Indicator	5, 10, 50% full scale	30%, 100% full scale
	Accuracy: ± 10% of full scale	Accuracy: ± 10% of full scale
Distortion Rate	0.1 ~ 30MHz: less than 1% at 30% Mod. 30 ~ 120MHz: less than 3% at 30% Mod	0.1 ~ 30MHz: less than 0.5% at 30% Mod. 75 ~ 115MHz: less than 3% at 30% Mod.
FM Stereo Modulator (Only for the LSG-216)	———	Pilot Frequency: 19kHz, within ± 2Hz, Separation: 50dB or more (1kHz reference), Function: (4-kind): L, R, MAIN, SUB
FM External Modulation	Frequency range: 20Hz ~ 100kHz, Frequency response: ± 1dB (1kHz ref.),Input impedance: 10kΩ	
AM External Modulation	Frequency range: 20Hz ~ 10kHz, Frequency response: ± 1dB (1kHz ref.)	
Preset	Using the internal memory, 100 points of presettings can be stored for combinations of frequency, modulation type, and output level. Separately available memory unit, EPROM, can be ordered.	
Power, Size and Weight	AC100, 120, 220, 240V, 50/60Hz, 400(W) x 100(H) x 300(D)mm, 7kg,	

Signal Generator

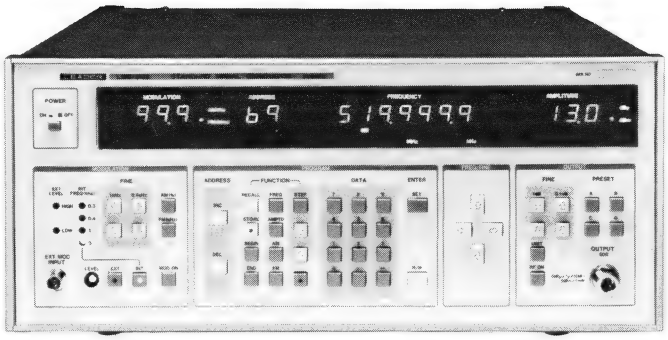
STANDARD SIGNAL GENERATORS

LSG-203



LSG-202

GP-IB OPTION



800MHz ~ 1GHz

The LSG-203 is a synthesized signal generator designed to generate an internal modulation frequency of 800MHz ~ 1GHz CW and FM modulation signals. This model is used for personal radio, MCA, car telephone, and cordless telephone production lines. LED digital indicators show frequency, output level, address, deviation, etc. The remote control function is standard equipment.

500kHz~ 520MHz

The LSG-202 is a synthesizer-type standard signal generator that produces continuous waves of 500kHz to 519.9999MHz and continuous FM-AM modulated waves. It is a SSG suited for adjusting, testing, designing, and developing communications and radio equipment in VHF and UHF bands. The frequency, output level, and modulation can be easily set by digital display. A convenient memory is available to store up to 100 patterns. After being set, these patterns can be called by simple operation. The remote control unit is option.

■ SPECIFICATIONS

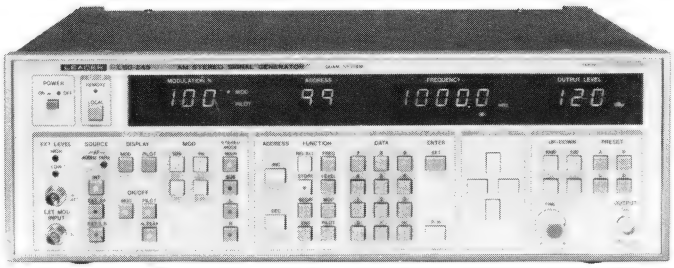
MODEL	LSG-203	LSG-202
Frequency		
Frequency Range	800~999.9999MHz	0.5~519.9999MHz
Frequency Resolution Frequency Setting	100Hz Ten-key, rotary encoder	100Hz Ten-key, UP/DOWN key
Frequency Accuracy Long Term Freq. Stability Indication (1)	± 1 x 10^{-6} (10°C ~ 40°C) ± 2 x 10^{-7} /WEEK 7-digit digital indication	
Indication (2)	Channel number and ΔF indication	————
Output		
Output Range	−10~110dBμ (0dB= 1μV open circuit) −123~−3dBm (0dBm=1mW 50Ω)	−20~126dBμ (0dB= 1μV open circuit) −133~+13dBm (0dBm=1mW 50Ω)
Output Resolution	1dB Ten-key and 10dB, 1dB up/down	0.1dB Ten-key and 1dB, 0.1dB up/down
Reference Level Accuracy	±1dB (at 110dBμ)	±1dB (at 126dBμ)
Attenuator Accuracy	±1.5dB (output ≧ 0dBμ) ±2dB (output < 0dBμ)	
Output Impedance	50Ω VSWR less than 1.3	
Spurious Output	Harmonic less than −30dBc, Non Harmonic less than −40dB (800MHz ~ 999.9999MHz)	Harmonic less than −30dBc, Non Harmonic less than −40dB (0.5kHz ~ 519.9999MHz)
Output Protection (Auto Reset Type)	The attenuator is protected from excessive reverse input voltage. (Maximum 15W)	
Indication	3-digit digital indication (dBμ, dBm)	4-digit digital indication (dBμ, dBm)
Modulation		
FM Modulation Frequency Deviation	0 ~10.0kHz	0~49.9kHz (32.5~65MHz) 0~99.9kHz (0.5~32.5MHz, 65~520MHz)
Indication	3-digit digital indication	
Resolution	0.1kHz	0.1kHz
Modulation Accuracy	±0.5kHz of indicative value	10% of indicative value
Distortion Rate	less than 0.5% (3.5 kHz deviation 1kHz) (demodulation band 300Hz~3kHz, 75μs de-emphasis)	less than 1% (75kHz deviation 1kHz)
AM Modulation Modulation Degree Indication Resolution Modulation Accuracy Distortion	————	0~90% 3-digit digital indication 0.1% of indicative value ±10% less than 1%
External Modulation Input Impedance	10kΩ	600Ω
Reference Input	0.5Vrms	0.5Vrms
Modulation Accuracy	less than ±10% (Reference 1kHz)	
Modulation Freq. Response	100Hz~10kHz	20Hz~10kHz AM 100Hz~100kHz FM
Internal Modulation Freq.	300Hz, 1kHz, 3kHz (±5%)	300Hz, 400Hz, 1kHz, 3kHz (±5%)
Residual Modulation FM component	More than 50dB in S/N for 3.5kHz deviation, 1kHz (demodulation band 300Hz~3kHz)	
Preset	Using the internal memory, 100 points of presettings can be stored for combinations of frequency, modulation type, and output level	
Power Supply	AC100, 120, 200, 220, 240V approx. 47VA	approx. 92VA
Size and Weight	400(W)x150(H)x300(D)mm, approx.13kg	426(W)x172(H)x450(D)mm 18 kg
Accessories	3D2W N-N (50Ω) cable (1m) . . . . . 1 Power cord 1	

Signal Generator

AM STEREO STANDARD SIGNAL GENERATOR

LSG-245

GP-IB OPTION



NEW

200 ~ 1999.9kHz

C-QUAM by Motorola

The LSG-245 is a synthesizer-type standard signal generator which produces continuous waves of 200.0kHz to 1999.9kHz and AM stereo (C-QUAM) signals.

■ FEATURES

- Highly stable signals can be obtained for oscillating frequency is locked at reference frequency.
- Output level can be set by 1dB step upto −10 ~ 120dBμ (0dB = 1μV50Ω open circuit). Level continuously variable in-between 1dB step is available by fine adjustment knob.
- Internal memory is capable of pre-setting a set of frequency, modulation and output level upto 100 sets. Its memory is backed up with battery.
- Frequency, modulation and output level can be set with ten-keys.
- 36P connector on rear and all switches on panel (excluding power supply switch) can be remotely controlled.
- GP-IB interface (listener) is available as an option.

■ SPECIFICATIONS

Frequency Range	200 ~ 1999.9kHz
Frequency Resolution	100Hz, 5-digit indication
Frequency Accuracy	$\pm 5 \times 10^{-5}$
Output	
Range	−10 ~ 120dBμ (EMF)
Resolution	1dB step, ±1dB continuously variable 3-digit indication
Impedance	50Ω
Reference Level Accuracy	±1dB (at 120dBμ)
Attenuator Error	±1dB
Spurious	less than −40dBc
Internal Modulation	
Frequency	400Hz, 1kHz ±3%
Mode	MAIN, SUB, L, R
Modulation Degree	MAIN, SUB: 0 ~ 125% L, R: 0 ~ 75% (SUB 100% = 45° at MAIN 0%)
Resolution	1% step 3-digit indication
Modulation Accuracy	±(indicated figure x 0.05 + 2) %
Distortion	MAIN: less than 0.2%, SUB: less than 0.5% (at 400Hz, 50% modulation)
External Modulation	
Frequency Range	50Hz ~ 15kHz
Frequency Response	within ±0.5dB
Mode	EXT-AF (same function as internal modulation) & EXT-L, R
Input Impedance	10kΩ
Reference Input Voltage	1Vp-p gives 100% modulation
Cross-Talk	MAIN → SUB less than −45dB (at 400Hz, 50% modulation) SUB → MAIN less than −60dB (at 400Hz, 50% modulation)
Separation	35dB or more (400Hz ~ 4kHz, 50% modulation) 25dB or more (100Hz ~ 10kHz, 50% modulation)
Negative Peak Clipper	ON/OFF possible, 95% ±3% or less
Residual Modulation	AM −65dB or less 50Hz ~ 10kHz PM −50dB or less against 50% modulation
Pilot Signal	
Frequency	25Hz, ON/OFF possible
Modulation	0 ~ 10%
Resolution	0.1% step 3-digit indication
Modulation Accuracy	± (indication figure x 0.05 + 0.2) %
Power Supply	AC100, 120, 220, 240V ±10% 50/60Hz approx. 35VA
Size and Weight	426(W) x 132(H) x 300(D) mm, approx. 8.5kg
Accessory	3D2V BNC ~ BNC cable (1m) 1

Signal Generator

FM STEREO SIGNAL GENERATOR

LSG-231

50dB Separation

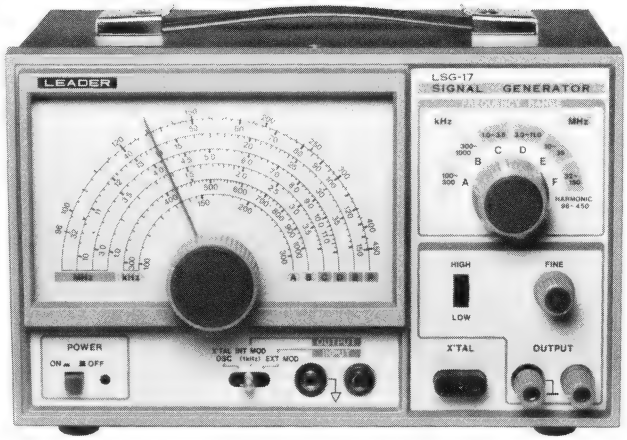
- Over 50dB left-right channel separation at 1kHz for critical separation tests.
- Phased condition of the pilot and subcarrier signals is of the highest degree.
- Modulated RF output for simulation of FM broadcasts signals is used in overall receiver testing.
- Pilot signal level can be adjusted in the range, 0 to over 10%, independently of the composite signal.

■ SPECIFICATIONS

RF Section	
Carrier Frequency	100MHz ± 1MHz, adjustable
Output Voltage	Three steps at approximately 10, 1, and 0.1mV
Output Impedance	75Ω, unbalanced.
Frequency Deviation	Pilot: 7.5kHz, Composite: 0 ~ 75kHz, adjustable.
Composite Signal	
Pilot Signal	19kHz ± 2Hz; output, 0.8Vrms;
Internal Modulation	1kHz ± 1%; output, 1Vrms; distortion, less than 0.5%
L-R Separation	Over 50dB
External Modulation,	
Frequency Range	50Hz ~ 15kHz
Pre-emphasis	50, 75μs: and off
L-R Separation	Over 45dB: 100Hz ~ 3kHz. Over 35dB: 50Hz ~ 15kHz.
Output Voltage,	0 ~ 1Vrms, adjustable
Subcarrier Leakage	Less than −40dB.
Pilot Signal Output	100mVrms,
SCA Signal	67kHz ± 3kHz.
Power Supply	AC100, 120, 220, 240V, 50/60Hz; 10VA approx.
Size and Weight	200(W) x 80(H) x 250(D)mm; 2.5kg. approx.

SIGNAL GENERATOR

LSG-17



100kHz~150MHz(450MHz)

LSG-17 is a very versatile, wide-band signal generator designed for the radio experimenter, hobbyist, service technician and instructional purposes.
A customed IC is used in a stable oscillator circuit to cover the frequency range from 100kHz to 150MHz on fundamentals and up to 450MHz on harmonics.

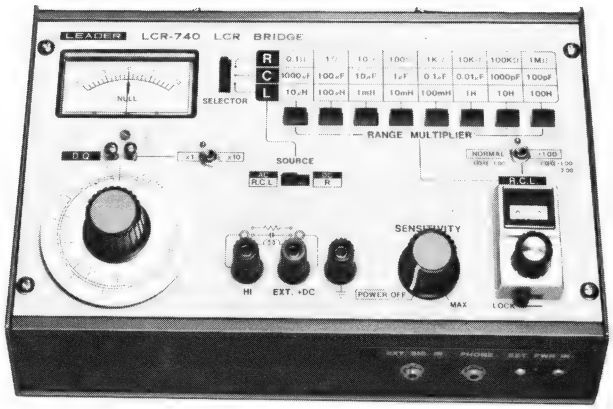
■ SPECIFICATIONS

Frequency Range	100kHz ~ 150MHz (Up to 450MHz on harmonics.) A 100kHz ~ 300kHz B 300kHz ~ 1000kHz C 1.00MHz ~ 3.5 MHz D 3MHz ~ 11MHz E 10MHz ~ 35MHz F 32MHz ~ 150MHz (96MHz ~ 450MHz)
RF Output Output Control	Approx. 0.1Vrms (no load) High-Low switch & fine adjuster
Modulation	INT: 1kHz, 30% EXT: 50Hz ~ 20kHz (30%, approx. 150mV input)
Audio Output Crystal Oscillator	1kHz, Over 1V For 1 ~ 15MHz (crystal not included): type FT-243
Power Supply Size and Weight	AC100, 115~120, 220~240V 50/60Hz, 3VA approx. 238(W) x 150(H) x 130(D) mm 2.5kg approx.

LCR Meter

LCR BRIDGE

LCR-740



Measurement available by digital readout

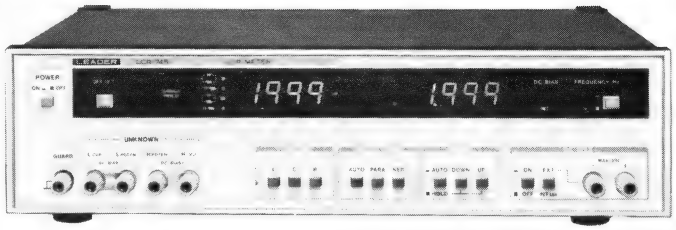
The LCR-740 is a highly efficient impedance bridge for broad and accurate measurement of Resistance (R). Capacitance (C) and Inductance (L). The D factor of a capacitor and the Q factor of a coil can also be measured. A 3-digit readout provides easy reading of the measured value.

■ SPECIFICATIONS

Resistance Measurement Range Minimum Resolution Accuracy (at 20°C ± 5°C)	 0.001Ω ~ 11MΩ in eight ranges with +10% extension at each range. 1mΩ (0.001Ω) 1Ω ~ 100kΩ: ± (0.5% + 0.1% f.s.) 1MΩ: ± (1% + 0.1% f.s.) 0.1Ω: ± (2% + 0.1% f.s.)
Capacitance Measurement Range Minimum Resolution Accuracy (at 20°C ± 5°C)	 1pF ~ 11,000μF in eight ranges with +10% extension at each range. 1pF 100pF ~ 100μF: ± (0.5% + 0.1% f.s.) 100pF; ± (1% + 0.1% f.s.) 1000μF: ± (3% + 0.1% f.s.)
Inductance Measurement Range Minimum Resolution Accuracy (at 20°C ± 5°C)	 0.1μH ~ 1100H in eight ranges with + 10% extension at each range. 0.1μH 100μH ~ 10H: ± (0.5% + 0.1% f.s.) 100H: ± (1% + 0.1% f.s.) 100μH: ± (3% + 0.1% f.s.)
D, Q measurements Range Accuracy	 0.01 ~ 30, at 1kHz, in two ranges. ±10% + 3 scale divisions
Measuring Sources	DC: Internal or external for resistance measurements. AC: Internal 1kHz, or external for resistance inductance and capacitance measurements.
Power Supply Size and Weight	9V DC (006P, NEDA 1604, or equivalent). 240(W) x 85(H) x 170(D)mm; approx. 2kg
Accessory Option, Separate Order	Cord w/mini-plug and clips ..... 1 AC adaptor, LPS-169

DIGITAL LCR METER

LCR-745



High Accuracy of Reading; Basic Accuracy of ±0.35% rdg

The LCR-745 is a digital LCR meter with a built-in CPU designed for measurements of capacitance (C), inductance (L), resistance (R), dissipation factor (D) (at capacitance measurement) and quality (Q) (at inductance measurement) at a high degree of accuracy. As this LCR meter has a wide range of measurements and the measuring ranges are automatically selected, quick and highly accurate measurement is possible. Further, equipped with an abundance of functions including the automatic offset function, this LCR meter can be used for a wide range of applications such as production lines, research and development, etc.

■ SPECIFICATIONS

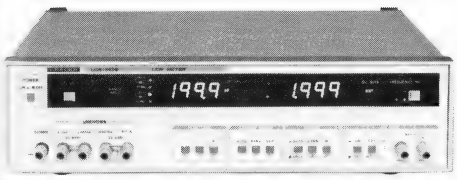
Measuring Items	Inductance (L) - Quality (Q) Capacitance (C) - Dissipation Factor (D) Resistance (R)
Indications	L, C, R . . . . 3 1/2 digits D . . . . . 3 1/2 digits Q . . . . . 3 digits
Circuit Modes	Parallel equivalent circuit and series equivalent circuit Automatic switching (AUTO) and parallel/series selection
Measuring Terminals **Range Selection** **Test Frequency**	Consist of 5 terminals of voltage, current and guard terminals. Automatic selection with RANGE HOLD. 1 kHz and 120 Hz ± 5%
DC Bias	(only when capacitance is measured): Internal + 1.5V, External 0 ~ +30V
Measuring Range	L: 0.1μH ~ 199.9H, Q: 0.5 ~ 99.9 C: 0.1pF ~ 1999μF, D: 0.001 ~ 1.999 R: 0.001Ω ~ 19.99MΩ
Basic Accuracy	L,C,R . . . . ± (0.35% + 2 digits) D, Q . . . . . ± (2% + 10 digits)
Offset Function **Range of Correction** **Deviation Measurement**	Automatic zero correction of residual component Inductance: 0 ~ 15μH Capacitance: 0 ~ 15pF Resistance: 0 ~ 15mΩ Range of zero correction: All ranges Indicating value: (Measured value—reference value) + 0 or 1 count
Measuring Time	Max. about 0.5 seconds
Power Supply **Size and Weight** **Accessories**	AC 100, 120, 200, 220, 240V 400(W) x 100(H) x 300(D)mm, 5.5kg Short-circuit plate 2

LCR Meter

GP-IB LCR METER

LCR-745G

GP-IB



GP-IB INTERFACE built-in

The LCR-745G is an upgraded version of the LCR-745, LCR Meter. The LCR-745G can provide GP-IB functions, controlled remotely by a controller, and can perform data output.

■ SPECIFICATIONS

(For GP-IB function only)

Standard Conformity	Based on IEEE 488-1978
Applicable Code	ASCII
Available Remote Controls	• All operations on the operation panel, except ON/OFF of D and Q • Data hold and trigger for measurement
Interface Functions	SH1, AH1, T5, L4, SR1, RL1, DC1, DT1

Interface Functions

Code	Function and description
SH1	Source handshaking
AH1	Acceptor handshaking
T5	Basic TALKER function, serial polling, TALK-ONLY mode, and TALK release by setting LISTENER mode
L4	Basic LISTENER function and LISTEN release by setting TALKER mode
SR1	SERVICE REQUEST function
RL1	Remote-control function
PP0	Parallel polling function not available
DT	Device triggering (GET command applicable)
DC1	Device clearing function ("SDC" & "DCL" command applicable
C0	Controller function not available

Test Fixture (optional)

LF-2350

BCD DATA OUTPUT LCR METER

LCR-745-01

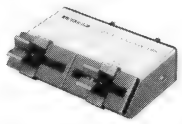
Completed with BCD data output

The LCR-745-01 is a BCD interface device to adds a function of BCD data output to the LCR-745 LCR Meter. The device can make output of the measured values and measuring conditions, including frequencies, etc., achieved in measurement of L, C, and R or Q and D.

■ SPECIFICATIONS

Output Data LCR/QD	Positive logic parallel 4-digit BCD (L and C data output alternate with Q and D data output. The difference between the two groups of data according to flag)
Measuring Conditions Range Circuit Mode DC Bias OFFSET Other Data	 HOLD/AUTO Ls, Lp, Cs, Cp, Rs, Rp AUTO/SER OR PARA ON/OFF INT/EXT IN/OUT Overflow/underflow, unit, decimal point and polarity
Data Strobe Signal Data Level	Negative pulse about 200μs TTL level (open collector, max. low level output current of 8mA)
Data Holding	Holds data by switching externally the HOLD terminal from HI to LO (TTL level)
Output Connector	36-station connector (attached to the rear body of the LCR-745) Applicable connector: the 57-30360 of Amphenol.

LF-2351



COMPARATOR UNIT

LCR-745-02

Digital comparator used along with LCR-745-01

The LCR-745-02 is a digital comparator used in combination with the LCR-745-01 LCR Meter, to make GO/NO (good/no good) judgement.
The comparator displays the result of total GO/NO judgement.

* LCR-745-02 can be used along with LCR-745-01 only but can not be used with LCR-745 or LCR-745G.

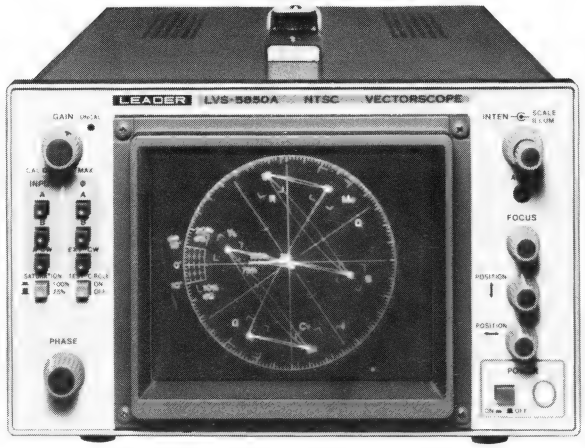
■ SPECIFICATIONS

Values to be Judged	LCR data and QD data
Threshold Setting Range LCR	 Normal Measurement 0000~1999 (upper limit > lower limit) Deviation Measurement positive side 0000~1999 negative side −1999~0000
QD	0000~1999 (upper limit > lower limit)
Threshold Setting Device	4-digit digital switches for both LCR QD
Determination Display Total Determination LCR QD	 GO or NO LED and buzzer (volume adjustable) HI or LO LED HI or LO LED
Output of Determination	relay contact (30V, 0.5A)
Measurements before Determination	From 1 through 9 times (set by a digital switch)
On/Off of QD	Interlocked to QD ON/OFF switch of the LCR-745-01
Trigger Setting AUTO SINGLE	 Determination repeated automatically Only one determination controlled by panel switch or a remote-control device
Size and Weight Accessories	400(W)x30(H)x300(D) mm, 2.5kg connection cable 1

Vectorscope

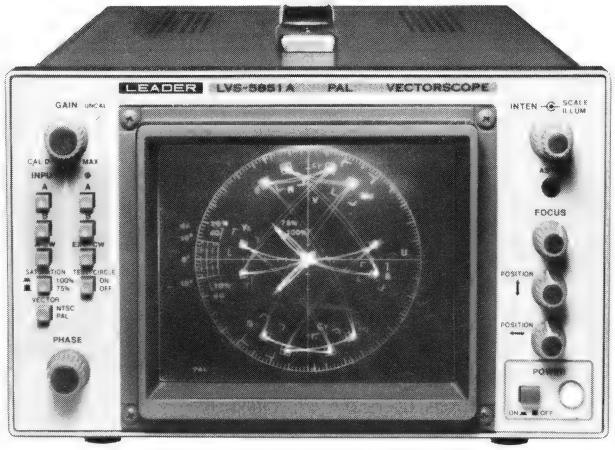
NTSC VECTORSCOPE

LVS-5850A



PAL VECTORSCOPE

LVS-5851A



Vector Indication of Chrominance Signal of Video Signal and Simultaneous Measurements of Phase and Amplitude

The LVS-5850A is a NTSC color TV system vectorscope and the LVS-5851A is a PAL color TV system vectorscope for vector display of relative amplitude and phase of chrominance components contained in composite video signals on the CRT.
Phase (direction of rotation) and amplitude (radial length from the center) of chrominance components against burst signals can be measured by demodulating chrominance components, which convey color information in video signals and by vector-displaying them on the CRT. Luminance sequential color bar signals (NTSC: LCG401, LCG-400; PAL: LCG-399A) are used for test signals. There are the specified color allowable frames for R, G and B on the vectorscope.
As the scale is provided on the internal-graticule (with the scale illumination), it is possible to measure color bar signals without parallax reading error. As the CRT is the post-acceleration type, its luminance is extremely bright with a small and sharp luminescent point.
The vectorscope is in half-rack shape sized in inch, small in size, light in weight and a system can be composed with another measuring instrument using a rack-mount adapter (separately available: sized in inch/mm) that allows assembly of the waveform monitor in pair with the vectorscope.

■ LVS-5850A/5851A Common Specifications

Model	LVS-5850A	LVS-5851A
CRT Type Acceleration Voltage Effective Display Area	150mm, Rectangular, Internal-graticule 7 kV/2 kV 80mm x100mm	
Scale (with illumination)	Allowable frame, ±20%/10°, ±2.5IRE/±2.5° of standard color bar circle, angle, R-Y axis B-Y axis, I.Q. axis and DG, DP	Allowable frame, ±20%/10°, ±5%/3° of standard color bar circle, angle U axis,V axis DG, DP
Composite Video Signal Input Sensitivity	Input A & Input B Calibration Value; Degree of color saturation: 75%, 100% F.S. Variable range: approx. 0.5~5 times of calibrated value	
	Amplitude: 1 Vp-p, 1.24 Vp-p full scale	Amplitude: 1 Vp-p, 1.23Vp-p full scale
	EXT. CW: 2 Vp-p ± 6 dB	
Input A	Rear panel BNC connector loop through composite video signal/subcarrier signal Input impedance: approx. 2MΩ	
Input B	Rear panel BNC connector loop through composite video signal Input impedance: approx. 2MΩ	
EXT. CW	Rear panel BNC connector loop through sub-carrier signal Input impedance: approx. 10 kΩ	
Blanking Input	Sensitivity: DC ± 1V, Polarity: bright at positive	
Chrominance Bandwidth	Center: Fsc=3.579545MHz	Center: Fsc=4.43361875MHz
	High range: Fsc + approx. 500 kHz Low range: Fsc − approx. 500 kHz	

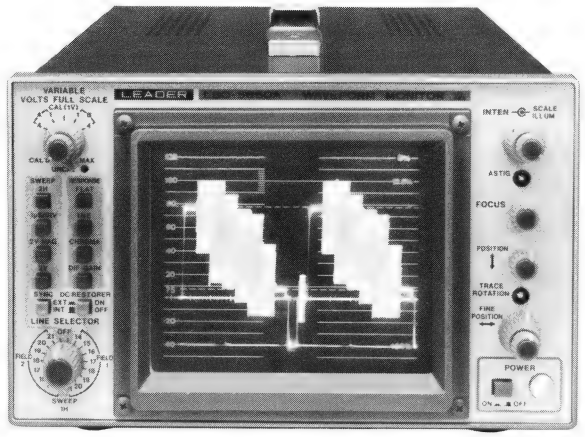
Phase Shift Accuracy	± 2°	
Amplitude Accuracy	± 3 %	
Differential Phase	± 1°	
Differential Gain	± 1 %	
Measuring Items Vector Measurement	Saturation level of 75% or 100% measurement of relative phase and amplitude of color bar chrominance signal of color bar	
Display	NTSC display	PAL/NTSC display
Horizontal Synchronization	Synchronized by horizontal sync signal of input A or B composite video signal Sync polarity: Negative	
Sync Level Range	0.286Vp-p ± 6 dB	0.3 Vp-p ± 6 dB
Subcarrier Signal Synchronization Sync by Burst	Synchronized by burst signal in composite video signal	
Sync Level Range	0.286 Vp-p ± 6 dB	0.3 Vp-p ± 6 dB
Sync by External Subcarrier Signal	Synchronized by subcarrier signal applied to input EXT. CW. subcarrier signal sync level range: 2 Vp-p ± 6 dB	
Subcarrier Frequency	3.579545 MHz	4.43361875 MHz
Sync Capture Range	± 50 Hz (0°C ~ 40°C)	
Phase Adjustment Range	360° continuously variable	
Calibration Function Test Circle	Chrominance signal applied from input A or B made asynchronous and used at test circle	
Power Supply Size and Weight	AC100, 120, 220, 240V 50/60Hz 40VA 215(W) x 132(H) x 423(D)mm, approx. 6 kg	

*For rack-mount adaptor see page 87.

Waveform Monitor

525 LINES NTSC·PAL WAVEFORM MONITOR

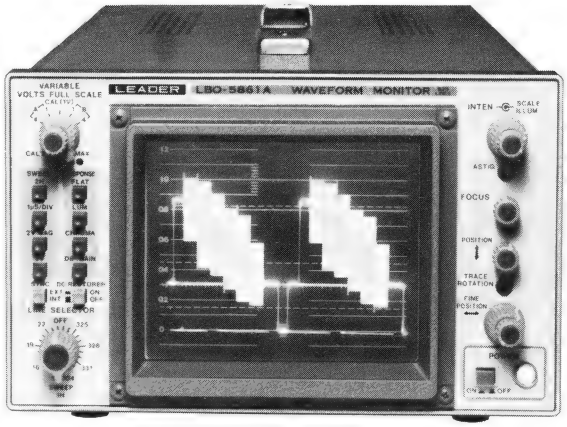
LBO-5860A



Designed for NTSC/PAL-M System, Subcarrier : 3.58MHz

625 LINES PAL·SECAM WAVEFORM MONITOR

LBO-5861A



Designed for PAL/SECAM-B, C, D, G, H, I, K & L Systems, Subcarrier: 4.43MHz

LBO-5860A (525 lines, NTSC, PAL color TV system) and LBO-5861A (625 lines, PAL, SECAM color TV system) Waveform Monitors are oscilloscopes that are capable of quickly monitoring amplitude, time, frequency response, etc. of complex TV signals, which are hard for ordinary oscilloscopes to measure.
As the TV broadcasting system is different by country, LBO-5860A is suited to M system (525 scanning lines) and LBO-5861A is suited to B, C, D, G, H, I, K and L systems (625 scanning lines) according to synchronous system and subcarrier frequency.
The waveform monitor is equipped with various mode and trigger functions that are optimum to video signal monitoring. Such various modes as 2H (1/2 line repetitive sweep. Displayed in 2 frames), 1 μs/div (sweep calibrated to 1 div, 1 μs), 2V MAG (expanded sweep of approx. 20 times of 2V range) and 2V (2 field display sweep) can be selected by the horizontal axis sweep. As FLAT (all bands), IRE or LUM (a low-pass filter is inserted), CHROMA (a 3.58 MHz or 4.43 MHz band-pass filter is inserted and DIF GAIN (gain of about 3~5.5 times of CHROMA) can be switched, it is possible to observe various characteristics of video signals.

■ LBO-5860A/5861A Common Specifications

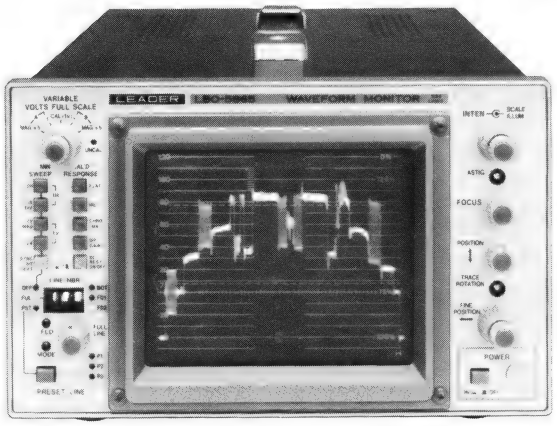
Model	LBO-5860A	LBO-5861A
CRT Display Type Acceleration Voltage Effective Display Area Beam Rotator	150mm, Rectangular, Internal-graticule 7 kV/2 kV 80mm x 100mm Preset is adjustable from the panel	
Full Scale Graticule	140 IRE: SYNC 40 IRE + Video 100 IRE	1.0 scale: SYNC 0.3 scale + Video 0.7 scale
Vertical Axis Freq. Characteristics FLAT	25 Hz ~ 3.6 MHz ± 2% 3.6 MHz ~ 5 MHz + 2% ~ –5% } 50 kHz reference	
IRE (LUM)	Conforming to STD 23S-1 of year 1958 IRE, Attenuation of more than 22dB at 4.43 MHz	
CHROMA	3.58 MHz band pass filter, Response: ± 2% for FLAT	4.43 MHz band pass filter, Response: ± 2% for FLAT
DIF. GAIN	About 3~5.5 times of chroma amplitude	
Deflection Accuracy 1V Full Scale Range	1V input full scale, ± 2% for 140 IRE	1V input, full scale, ± 2% for 1.0 scale
4V Full Scale Range	4V input full scale, ± 4% for 140 IRE	4V input full scale, ± 4% for 1.0 scale
Variable Range	Input voltage of 140 IRE full scale	Input voltage of 1.0 scale full scale
1V Full Scale Range 4V Full Scale Range	Less than 0.25 V ~ 1V Less than 1V ~ 4V	
Input Input Impedance	A and B (on the rear panel, 2 terminals each, loop-through type) 1V full scale range: 15 kΩ, approx. 50 pF 4V full scale range: 60 kΩ, approx. 50 pF	

Video Output	Provided on the rear panel: output level 1V ± 15% when 1V signal is applied to input A or input B at the 1V full scale Freq. Response: 25Hz ~ 5 MHz ± 5% Output Impedance: 75Ω
Horizontal Axis 2H Sweep 1 μs/div Sweep 2V Sweep 2V MAG Sweep	 Display of 2H waveforms 10 times magnification of 2H sweep, 1 μs/div ± 3% Display of 2V waveforms Approx. 20 times magnification of 2V sweep
RGB/YRGB Staircase Input Time Base Sweep Line Length	RGB is standard (YRGB is option) 10V ± 15%, 9 div. indication RGB (3 steps), YRGB (4 steps) RGB ... approx. 30% of the standard time YRGB ..approx. 22% of the standard time
Control Signal RGB, YRGB input	12V~15V Pin 4 (positive), Pin 5 (negative) Pin 9 MT socket at the rear panel
DC Regeneration	Clamp at the back porch
Calibrator	Amplitude: 1V ± 1% Frequency: approx. 32kHz
External Synchronization Input Input Sensitivity	 Rear panel, 2 terminals, loop through type, impedance approx. 15 kΩ 1.5V~5V (Sync signal level is composite video signal)
Line Selector Display Lines	 1st field, 2nd field 13~22 lines 14~21 lines 325~334 lines
Blanking Output	Output voltage level: Period of line selected by the line selector . . OV Other period . . . . . –2V
Power Supply Size and Weight Accessories	AC100, 120, 220, 240V, 50/60Hz, 45 VA 215(W) x 132(H) x 423(D)mm, approx. 6.5 kg MT plug (9 pins) . . . 1 Spare Fuse 1

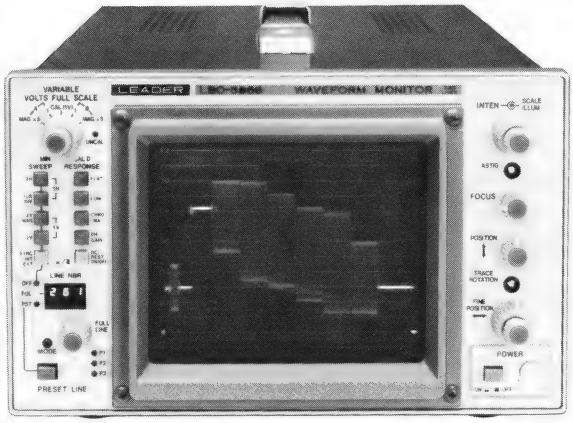
Waveform Monitor

BUILT-IN FULL LINE SELECTOR HIGH GRADE WAVEFORM MONITORS

LBO-5865 *NEW*



LBO-5866 *NEW*



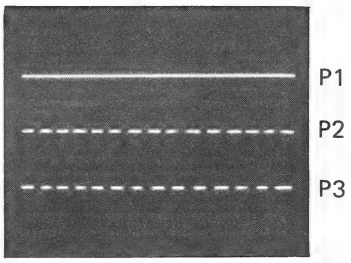
NTSC 525LINES

PAL 625LINES

FULL LINE SELECTOR FOR TV CAMERA TEST

In addition to conventional waveform monitoring functions, the LBO-5865 (NTSC) LBO-5866 (PAL) can monitor all lines on the television screen and any one selected line including the vertical blanking period, and display a bright marker on the television screen to indicate which line is being monitored.
The CRT is bright enough (PDA16.5kV) to display a bright, sharp waveform when either one horizontal line (field 1 or field 2 LBO-5865 only) is displayed in the vertical frame or both fields are displayed simultaneously.
The LBO-5865·5866 are useful not only on the TV camera production line, but also in studio and other outdoor location work.

Three Preset Lines

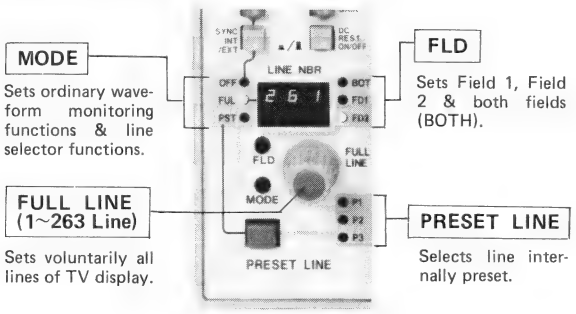


- The selected lines are indicated one at a time by markers on the TV screen.
- Remote control enables five lines to be preselected.
- Remote control connector: 8-pin DIN type.

■ FEATURES

- Black level can be confirmed by MAG x 5 (1V → 0.2V).
- The instrument can be set up to cycle through three preset lines (five if remote control is used), which is a convenient feature for inspection during the camera production process.
- A bright marker indicates the selected line (including the full line selector) on the TV screen.
- The selected line number including preset lines is always indicated by a 3-digit LED display.
- A pushbutton switch stores the final settings (including the line numbers) in battery backed up memory so they are held even with power turned off.

■ Full Line Selector LBO-5865



■ SPECIFICATIONS

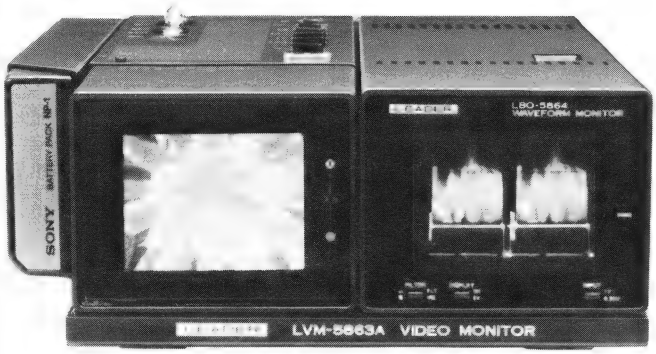
CRT Acceleration Voltage	16.5kV/2kV
Sensitivity	1Vp-p full scale ±2% MAG x 5 full scale ±4% CAL'D at F.C.W.
Sweep (additional) Line Display	1H, 1V One selected horizontal line is displayed. A LED display indicates the line number.
Full Line Select	Any line from (1~263 LBO-5865, 1~625 LBO-5866) can be selected by a pulse switch. Field 1, Field 2, or both can be selected for each line (5865 only).
Preset Line Select	Any three or five selected lines can be internally preset.
Remote Control Function	Line select, full line select, field select (LBO-5865 only), and mode select.
Last Memory Function	The last switch settings and line numbers are held in memory even when power is turned off.
Video Output	A pulse corresponding to the selected horizontal line is added to the video output, to display a white-line marker on the video monitor screen.

*All other specifications are common to LBO-5860A (NTSC) or LBO-5861A (PAL).

VIDEO and WAVEFORM MONITOR

NTSC VIDEO MONITOR

LVM-5863A



NEW

NTSC WAVEFORM MONITOR

LBO-5864

NEW

Full Range of Monitoring Functions and Highly Portable Battery Operation

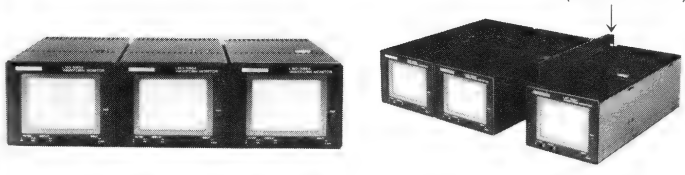
The LVM-5863A Video Monitor consists of the combination of a waveform monitor which provides a 2H and 2V video waveform display (LBO-5864) and a picture monitor which provides a color picture – all in one compact carrying case.
Outdoor video work in the past has chiefly relied on the experience and judgement of the cameraman and has thus traditionally been quite risky. This video monitor, however, provides the ability to monitor the color picture and sound and makes waveform measurements as pictures are taken, greatly enhancing the reliability of such field video work.
The LBO-5864 Waveform Monitor provides a 2V/2H, FLAT/IRE display and has selectable 1V/0.25V input sensitivity, valuable functions for use in field electronic news-gathering applications and in EFP applications as well. A newly designed linking plate enables combinations of monitors to be made up as required, in addition to stand-alone use. The LBO-5864 and LVM-5863A, with their compact highly versatile designs, are destined to be front-runners in tomorrow's video applications.

■ FEATURES

- Clear, sharp picture and waveform display
- 25Hz to 5MHz frequency response
- Selectable FLAT/IRE filter characteristics
- Selectable 1V/0.25V fullscale sensitivity (vertical axis expandable x4)
- Sweep: Switchable 2H/2V display
- Pilot lamp flashes when battery is low.
- Quickly removable batteries

■ Multi-Connection LBO-5864

Joint Plate
(PAT. PEND)



Linked LBO-5864 Operation: In addition to single-unit operation, several LBO-5864 may be easily and securely linked by just two screws and a linking plate between units. (The NP-1 battery can power only up to two units. For three or more units, use a higher capacity external supply.)

■ SPECIFICATIONS

Common to both the LVM-5863A and LBO-5864

WAVEFORM MONITOR	
CRT	85mm rectangular, internal-graticule, acceleration voltage: 1.5kV
Effective Display Area	52mm x 41.6mm
Beam Rotator	Adjustable by external preset
Vertical Amplifier	
Sensitivity	1V±2%, 0.25V±4% full scale range
Filter	FLAT/IRE
Frequency Response	25Hz~5MHz ±5% (FLT) 4.43MHz, –22dB (IRE)
Max. Input Voltage	±5V DC (0.25, 1V range), AC coupling
Input Terminal	BNC two terminals loop through 75Ω
Input Impedance	0.25V full-scale range, 15kΩ 1V full-scale range, 60kΩ
DC restoration	Clamped to TV-H back porch
Horizontal Amplifier	Sweep: 2H, 2V Linearity: ±3% or less
Power Supply	+11V ~ +13.8V (Falling battery voltages are indicated by the pilot lamp flashing on and off.)
Size and Weight	95(W) x 74(H) x 235(D)mm, 1.2kg

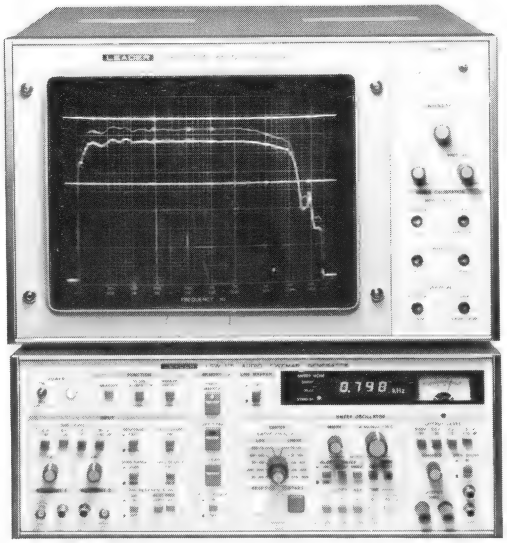
LVM-5863A

COLOR PICTURE MONITOR	
• Type: Color Video Monitor, TM-P3 • CRT: 85mm color CRT • Input/Output Terminal: Picture Input/Output Terminal (into 75Ω), Sound Input/Output Terminal (with built-in speaker: 4cm round-shaped)	
GENERAL	
Power Supply Power Consumption	12V (11 ~ 13.8V) 14W: Waveform Monitor: 8.6W, 720mA Picture Monitor: 5.7W, 450mA
Continuous Operation	With the BATT. PACK. NP-1 (1.5Ah): 80 minutes Waveform monitor: 125 minutes Picture monitor: 200 minutes Option: With the BATT. PACK. BP-90 (3.5Ah) EXT. (using the optional external power input connector): 180 minutes.
Size Weight	222(W) x 85(H) x 255(D)mm 4.0kg (including BATT, PACK, NP-1 and carrying case)
Accessories	Carrying case . . . . . 1 BATT. PACK (SONY): NP-1 . . . . . 1 DC Plug (with 1m cable) . . . . . 1 A standard accessory cable is supplied with the color picture monitor. Spare Fuse
Optional Accessories (for LBO-5864)	Joint Plate LA-2019 BATT. Attachment LA-2020

Audio Response

AUDIO RESPONSE TRACER

LSW-115/LBO-115M



MONITOR SCOPE LBO-115M

AUDIO SWEMAR GENERATOR LSW-115

Still Response Observation of Audio Equipment Frequency Response

Simultaneous Display of Two Individual Channels

The LSW-115 is a 2-channel audio sweep generator particularly designed for observations of frequency response of low frequency circuits such as of various audio equipments and filters.
Entire frequency response can be displayed as a still picture when a monitor scope is used in combination with the equipment since the digital wave memory is employed in the LSW-115. Use of the LBO-115M, specially designed monitor scope is recommended for such purpose.
Frequency response curve can be drawn on a recording paper when a X-Y recorder is used in combination.

■ FEATURES

- Still display observation of measurement response is now available which was not possible even by use of a long persistent CRT scope such as conventional frequency response observation equipment.
- The equipment has 2-channel input (with built-in logarithmic amplifier) which is convenient for measurements of stereo audio equipments.
- Measurement frequency range is 20Hz to 300kHz which is useful for all types of low frequency equipment measurements.
- Linear scaled narrow band sweeping is available which is convenient for alignments of filters. Holding function of CH2 measurement curve (by memorizing the waveform and to display it on the screen) is provided, thus the function can be used for alignment and comparison with a standard waveform.
- There provided 2 level markers with calibration control, 5 points frequency markers, and a variable marker with direct reading of frequency by a counter. Thus, they can be used for frequency analysis of a measurement curve.
- Calibration signal is available for calibration of the monitor scope to be used in combination.

■ SPECIFICATIONS

● LSW-115 AUDIO SWEMAR GENERATOR

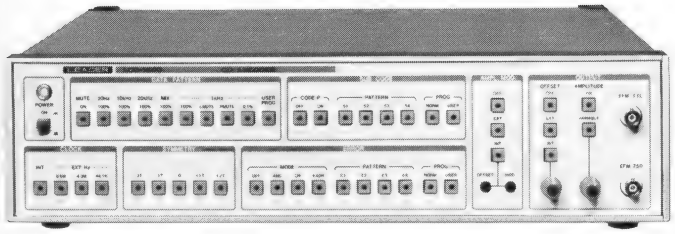
Input Section Frequency Range Voltage Range	 20Hz ~ 300kHz 100μV ~ 100V (−80dBV ~ +40dBV) 0.01, 0.1, 1, 10V 4 ranges
Frequency Response Automatic 0dB function	20Hz ~ 30kHz ±0.5dB, 30kHz ~ 100kHz ±0.8dB, 100kHz ~ 300kHz ±1.2dB Reference frequency; 1kHz or 315Hz pull-in range; ±10dB for 0dB set value
Digital Memory Resolution	 8 bits x 1k words/channel
Panel Operation	Hold; a respective single sweep waveform is fixed for each of dual channels or for CH-2 only Clear; The memory is cleared manually or automatically at the sweep start. Hard Copy; A single trace is recorded by a X-Y recorder in dual channel hold operation
Sweep Generator Frequency Range	 LOG Sweep; 20Hz ~ 30kHz, 200Hz ~ 300kHz 2 ranges LINEAR Sweep; 30Hz~ 300kHz 8 ranges
Pilot Signal	(Reference frequency) 1kHz/315Hz, Switchable
Sweep Accuracy	LOG Sweep; 20Hz ~ 30kHz ± (5% + 2Hz) 200Hz ~ 300kHz ± (5%+20Hz) LINEAR Sweep; ±5%
Output Mode	Automatic sweep; Single/Repeated, Switchable CW (manual operation); Frequency adjustment by the knob on the panel
Sig. Transmission Time Output Voltage Output Attenuator	Sweep Signal: 1, 2, 5, 16, 53 sec. Over 3Vrms (600Ω load) 0, 20, 40, 60dB 4 ranges
Marker Section Line Markers Frequency Markers	 2-lines (with ON/OFF function) Line markers; 5-points on measurement waveform and each of line markers Variable marker; A point in memory hold operation
Frequency Counter Action In CW Mode In HOLD Mode In Marker Setting	 Frequency indication of output signal Frequency indication of variable marker Frequency indication of frequency marker calibration signal
Gate Time Reference Time	0.5 and 0.05 sec, automatic switching Frequency 7.53664MHz, within ± 4 x 10^{-5}
Power Supply Size and Weight	AC 100V, 120, 220, 240V. 50/60Hz, 65VA 400(W) x 150(H) x 400(D)mm, 10.5kg approx.
Accessories	Connecting cables; BNC ~ BNC (4), BNC ~ Clip (2), Pair plug ~ Clip (1), Pin plug ~ Pin plug (4)

● LBO-115M MONITOR SCOPE

Vertical Sensitivity Vertical Bandwidth	Over 15cm of effective display size in 4Vp-p DC ~ 10kHz −3dB
Horizontal Sensitivity Horizontal Bandwidth	Over 20cm of effective display size in 4Vp-p DC ~ 1kHz −3dB
Frequency Marker Sensitivity System	(Intensity Modulation) 2Vp-p Brighter indication with positive or negative pulse
CH-2 Intensity Modulation Terminal	Input Voltage; TTL level (+5V / 0V) System; Low level duration is adjustable by CH-2 TRACE intensity adjustment knob.
Power Supply Size and Weight	AC 100; 120, 220, 240V, 50/60Hz, 80VA 400(W) x 250(H) x 400(D), 13kg approx.

CD ENCODER

LCD-1500



EFM SIGNAL GENERATOR

Adjusting and Testing for CD Players

This instrument is used for adjusting and inspecting CD players. The LCD-1500 is a signal generator designed to adjust and test the digital signal processing section and digital/analog converter section of a CD player.

■ FEATURES

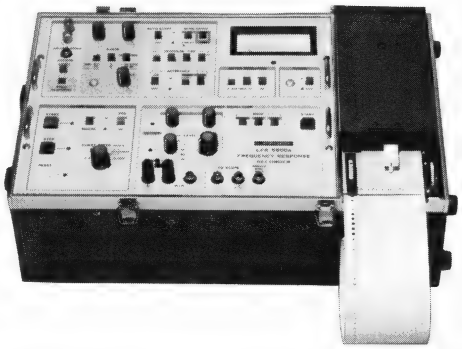
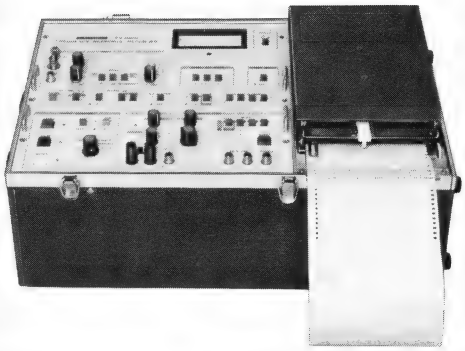
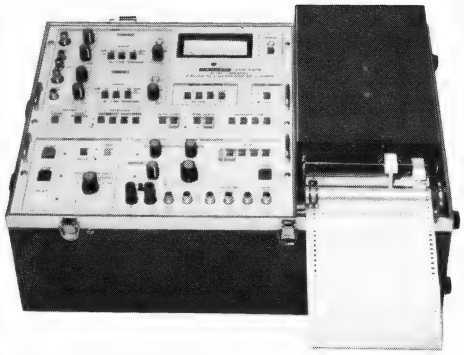
- Easy-to-operate signal generator for production lines and service divisions.
- 16-bit signal patterns are used. Four sine waves (20 Hz, 1 kHz, 10 kHz, and 20 kHz), one mixed wave (250 Hz + 8 kHz) and one user-defined wave (50 Hz step) can be used. A sine wave of 1 kHz has a signal level of 0.1%, L MUTE and R MUTE (output of 0%) in addition to 100%. This is very useful for checking S/N ratio signals.
- For subcodes, there are four types of combinations of code P off, and Q, R, S, T, U, V, and W (codes R ~ W are 0). Users can define four types of subcodes from codes Q ~ W.
- The symmetry of EFM patterns can be changed.
- Errors can be added to EFM patterns. There are four types of patterns that users can define (bit clock unit x 1, symbol unit x 2, frame unit x 1).
- Output signals are available in two types: TTL signal output and 75 Ω signal output. The PU signal output level can be changed. Offset and amplitude modulation are also available.
- Panel switching functions can be externally controlled.
- For S1 ~ S4, codes R ~ W are zero and Q is separately defined.
- Users can define S1 ~ S4.

■ SPECIFICATIONS

Code Mode	Compatible of compact disc standard											
Clock Frequency	Internal 8.6436MHz (X TAL) External 8.6MHz, 4.3MHz, 44.1kHz ±10%											
Data Pattern	L CH						R CH					
MUTE	0%						0%					
20Hz	100%						100%					
10kHz	100%						100%					
20kHz	100%						100%					
1kHz	100%						100%					
L MUTE	0%						100%					
R MUTE	100%						0%					
0.1%	0.1%						0.1%					
MIX	100%						100%					
	(250Hz 80% + 8kHz 20%)											
USER	User Programmable						User Programmable					
Sud Code P Code	On, Off											
Q Code		CONT	ADDR	TNO	IDX	MIN	SEC	FLAM	00	AMIN	ASEC	AFLAM
	S1	0	1	00	01	02	04	08	00	10	20	40
	S2	1	1	10	20	30	40	50	00	06	07	08
	S3	8	1	98	76	54	32	10	00	12	34	56
	S4	9	1	99	99	59	59	74	00	59	59	74
R~W code	S1~S4 all 0											
USER (Q~W)	S1~S4 User Programmable											
Symmetry	−1T, −0.5T, 0, +0.5T, +1T											
Error Mode	Off, AND (DATA 0), OR (DATA 1) EXOR (DATA INVERT)											
Pattern	E1: 1 bit clock E2: 24 frames continuously E3: 1 symbol E4: 128 symbols											
USER Error Ratio	E1 ~ E4 User Programmable 108×7 cycle											
Unit	E1: bit clock E2: frame unit E3: symbol unit E4: symbol unit E3 and E4 have the following one-symbol, 14-bit patterns: 0 when normal, 1 when error 00110011001100											
Amplitude Modulation	Off Internal 10Hz sine wave External 10Hz ~ 10kHz 2Vp-p											
TTL Signal Output	Fun out 3TTL											
75Ω Signal Output	Fixed 1.5Vp-p (on 75Ω load) Variable 0 ~ 1.5Vp-p (on 75Ω load) Offset Off Internal DC ± 1V Extenal DC ~ 10kHz, DC ± 1V											
External Signal Input A.M.	Frequency 10Hz ~ 10kHz Level 0 ~ 2Vp-p Input Impedance 1MΩ											
OFFSET	Frequency DC ~ 10kHz Level 0 ~ ± 1V Input Impedance 10kΩ											
CLOCK	Frequency 8.6MHz, 4.3MHz, 44.1kHz ±10% Level 1 ~ 5Vp-p Input Impedance 1MΩ											
Synchronizing Signal Output	Frame Sync, Subcode Sync, Error Sync, Error Bit (Negative logic)											
Remote Control	TTL level negative logic pulse (more than 5μ sec) Low level input current											
Power Supply	AC90~132, 198~264V, 50/60Hz, 25VA											
Size and Weight	400(W)×99(H)×300(D)mm, 4.3kg											
Accessory	Power cord 1											

Audio Recorder

FREQUENCY RESPONSE RECORDERS

LFR-5600A	LFR-5601	LFR-5602
		
50mm	50/100mm	50/100mm

The LFR-5600A, LFR-5601 and LFR-5602 are frequency response recorders to record frequency responses of various audio equipments on chart sheets. The LFR-5600A is used for monaural measurement with 50mm recording sheet. The LFR-5601 and LFR-5602 are high-function recorders for monaural and stereo measurements, respectively, with a switchable capability to use wide 100mm and standard 50mm recording sheets.

All three types use quick-drying ink for recording, thus no smearing nor smudging occurs. Further, recording pen of cartridge type is used, so that single-touch change of color is available. The LFR-5602 is equipped with the pen gap compensation circuit for dual-channel measurement operation, so it is particularly convenient for stereo measurement.

Recording the Frequency Response of a Broad Range of Audio Equipments

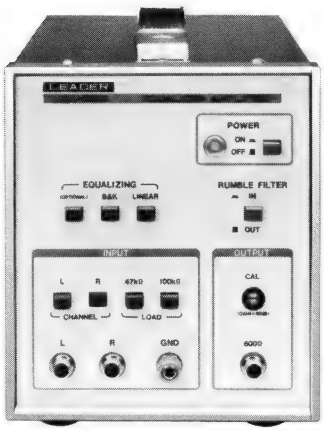
■ SPECIFICATIONS

MODEL		LFR-5600A (1CH)	LFR-5601 (1CH), LFR-5602 (2CH)
FREQUENCY RESPONSE Input Section Frequency Range Voltage Range		 20Hz ~ 30kHz 0.1, 1, 10V (–20, 0, +20dB) 3 Ranges	 20Hz ~ 30kHz 0.1, 1, 10V (–20, 0, +20dB) 3 Ranges
Span Range Response		25dB, 50dB, linear Average	25dB, 50dB, linear Average
Automatic 0dB Setting		Reference Frequency; 1kHz and 315Hz Pull-in Range; ±10dB, referenced to the 0dB setting	
Recording Section Chart Speed Display Scope		 4 steps; 0.3, 1, 3, 10mm/s 4.4 sec	 4 steps; 0.3, 1, 3, 10mm/s 4.4 sec
Recording Method Chart Size		Sign pen (cartridge type) Effective width: 50mm	Sign pen (cartridge type) Effective width: 50/100mm
Sweep Oscillator Frequency Range Sweep Operation		 20Hz ~ 30kHz Manual control, automatic start, chart stop, and reset.	 20Hz ~ 30kHz Manual control, automatic start, chart stop, and reset.
Indicator Meter Indication		Sweep frequency (20Hz ~ 30kHz), Input/Output Voltage (0 ~ 3Vrms) dB Level (–10 ~ +10dBV, 0dBV = 1V)	
DIRECT CURRENT Input Voltage Chart Speed		 10mV. 100mV. 1000mV/div 4 steps: 0.3, 1, 3, 10mm/s	 10mV. 100mV. 1000mV/div 4 steps: 0.3, 1, 3, 10mm/s
Power Supply		AC 100/120/220/240V, ±10% 50/60Hz approx. 20VA	AC 100/120/220/240V, ±10% 50/60Hz approx. 20VA (LFR-5601), 35VA (LFR-5602)
Size and Weight		400(W) x 175(H) x 250(D)mm, 8.5kg	450(W) x 200(H) x 300(D)mm. 10.6kg (LFR-5601), 11.6kg (LFR-5602)
Accessories	Connecting cord	BNC ~ clips, BNC ~ Pin-plug, Pin-plug ~ Pin-plug, Pin-plug ~ clips, Pin-plug ~ Mini plug	
	Cartridge Pen	5600A(Red & Black: 10mm type), 5601(Red & Black: 6.5mm type), 5602(Red: 25mm type, Black: 6.5mm type)	
	Chart Paper	LC-056 (50mm. LOG scale) . . . 1 roll. LC-057 (50mm. LINEAR scale) . . . 1 roll.	LC-056 (50mm. LOG scale) . . . 1 roll. LC-066 (100mm. LOG scale) . . . 1 roll.

Audio

EQUALIZER AMPLIFIER

LEA-5610



Frequency response of phono-cartridge, Gain : 40dB

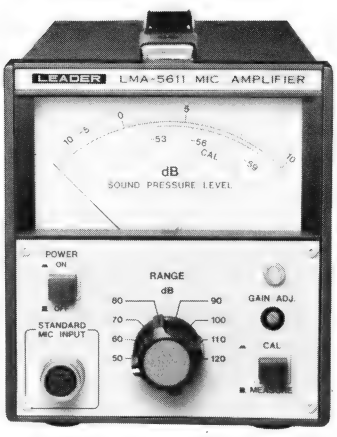
This instrument is an equalizer amplifier to measure the frequency response of phono-cartridge with the use of LFR-5600 series or LSW-115. With the amplifier gained and calibrated by 100 times, the output of phono-cartridge can easily be measured.

■ SPECIFICATIONS

Equalizing Curve	
Linear	20Hz ~ 50kHz
B & K	Test Record: QR 2009 (20Hz ~ 20kHz) QR 2010 (20Hz ~ 45kHz)
Deviation	± 0.5dB
Input Terminal	Pin-jack (L/R Switchable)
Input Resistance	47kΩ/100kΩ (Switchable)
Input Capacitance	70pF ± 10%
Amplitude Gain	40dB (100 times) by 1kHz
Output Terminals	On front pin jack 600Ω ± 10% On rear terminal 10kΩ ± 10%
Max. Output Voltage	Over 8Vrms
Rumble Filter	fo=14Hz 24dB/oct.
Residual Noise	Less than 6μV (4.7kΩ shunted)
Power Supply	AC 100, 120, 220, 240; 50/60Hz
Size and Weight	132(W) x 150(H) x 250(D)mm; 2.5kg

MIC AMPLIFIER

LMA-5611



20Hz ~ 38kHz

The LMA-5611 is a standard microphone amplifier for measurements of free field characteristics and loud-speaker pressure characteristics to be used in combination with LSP-5621A (power amplifier section), LFR-5600 series.

■ SPECIFICATIONS

Main Frame LMA-5611

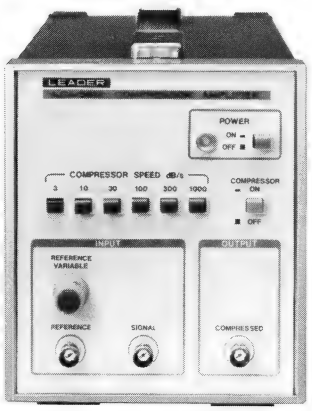
Frequency Range	80Hz ~ 25kHz ± 0.2dB 50Hz ~ 30kHz ± 0.5dB 20Hz ~ 38kHz { + 0.5dB, − 1.0dB
Level Range	45dB ~ 130dB
Input Range	50dB ~ 120dB 10dB step 8 ranges
Meter Scale	−10dB ~ +10dB
Output Voltage	1Vrms (0dB indication)
Power Supply	AC 100, 120, 220, 240V, 50/60Hz
Size and Weight	132(W) x 150(H) x 250(D)mm, 2kg

Microphone LM-061

Form	Condenser type, ½ inch
Frequency Response	20Hz ~ 38kHz ± 2dB (referred at 250Hz)
Directivity	non-directional
Sound Pressure Sensitivity	−56dB ± 2dB (0dB=1V/dyne/cm² 250Hz)

COMPRESSOR AMPLIFIER

LCA-5612



NEW

The LCA-5612 may be used in combination with the LSW-115 Audio Response Tracer or LFR-5600A/5610/5602 Frequency Response Recorder and LSP-5621A Speaker Analyzer Unit and Microphone to enable measurements of the frequency response of microphones.

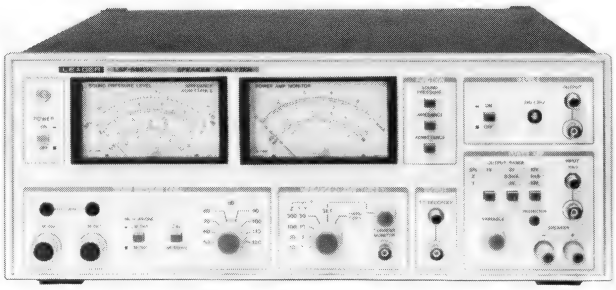
■ SPECIFICATIONS

Reference Input	Frequency Range: 10Hz~30kHz, Input Level Range: −40dBV~+10dBV, Input Impedance: 51kΩ
Signal Input	Frequency Range: 10Hz~30kHz, Input Level Range: +10±2dBV, Input Impedance: 51kΩ
Compressor	
Frequency Response	20Hz~20kHz: ±0.5dB, 10Hz~30kHz: ±1dB (1kHz reference)
Compression Range	20dB
Compression Speed	3, 10, 30, 100, 300, 1000dB/s
Gain	0dB
Distortion	0.5% or less (1kHz, 100dB/s)
Output	Output Impedance: 600Ω
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 4VA
Size and Weight	132(W) x 148(H) x 250(D)mm, 2.2kg
Accessories	BNC~BNC cable . . . . . 1 BNC~pin plug cable 2

Audio

SPEAKER ANALYZER

LSP-5621A



Frequency Response, Impedance and Admittance of Speaker can be measured

The LSP-5621A is a speaker analyzer for measuring frequency characteristics of a speaker, combined with the use of a Frequency Response Recorder LFR-5600A.

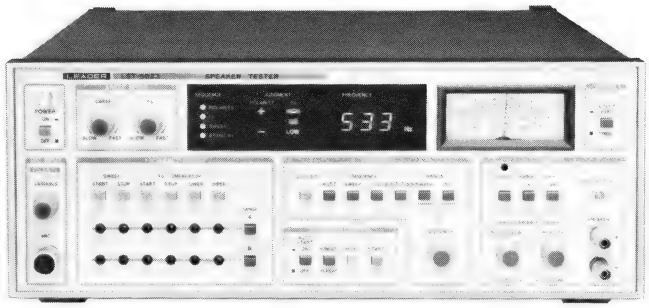
- Measurement of frequency response and impedance and admittance characteristics of a speaker are easily accomplished.
- Sound pressure, impedance and admittance can be obtained by directly reading meter.
- The level of the power amplifier contained in the unit can be read directly from a meter.
- Impedance and admittance can be measured at any desired level.
- The oscillator for warbling contained in the unit facilitates the measurement of frequency response in an audio room.
- The frequency of the oscillator for the warble tone is variable.
- A protective circuit (time return type) for short circuits of the output terminal is attached.

■ SPECIFICATIONS

Frequency Response Recroder	
Measurement Sound Pressure	
MIC. Amplifier	45~130dB (8 steps; 50~120dB)
Frequency Response	20Hz~20kHz (Within ±0.2dB) 20Hz~30kHz (within ±0.5dB) Except the MIC. frequency response
Output Voltage	1 Vrms (0dB)
Measurement Impedance	Constant Current system
Measurement Range	2~300Ω, Accuracy ±5% of F.S.
Hard Copy	2~300Ω, Accuracy ±5% of specified figure
Measurement Admittance	Constant Voltage system
Measuring Range	2~300Ω, Accuracy ±5% of F.S.
Hard Copy	2~300Ω, Accuracy ±5% of specified figure
Power Amplifier	
Maximum Output	25W (4Ω), 12.5W (8Ω)
Frequency Response	20Hz~30kHz (Within ±1dB)
Gain	Approx. 30dB
Warbling Oscillator	External signal source to make modulation for frequency of LFR-5600A
Oscillation Frequency	4Hz ~ 10Hz
Power Supply	AC100, 120, 220, 240V, 50/60Hz 20VA ~ 95VA (Max)
Size and Weight	400(W) x 148(H) x 400(D) mm, 7.5kg
Accessories	Microphone, connecting cords

SPEAKER TESTER

LST-5623



Fo of Speaker and Polarity can be measured

The LST-5623 is a speaker tester employing a sweep oscillator, and is capable of interpreting the polarity of a loud speaker, measuring Fo and determining LOW-GO-HIGH.

- The built-in power amplifier can directly drive a loud speaker.
- The Fo value is digitally displayed and the comparator determines whether the value is correct or not.
- For the sweep oscillator, the sweep start point and end point can be freely set.
- Equipped with the Auto Start function that enables immediate sweep start-up at speaker connection.
- The polarity of the speaker can be interpreted.

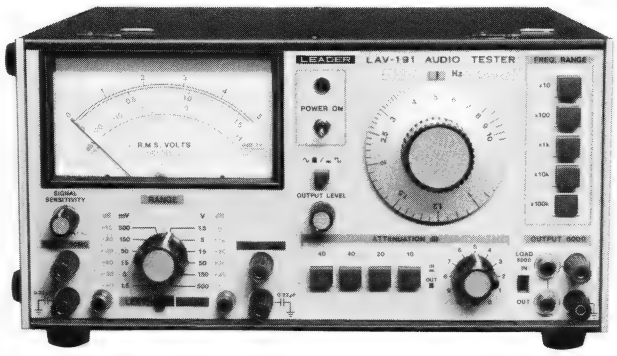
■ SPECIFICATIONS

Sweep Oscillation Section	
Sweep Freq. Range	10 Hz ~ 20 kHz
Frequency Indication	Meter and 4-digit counter
Output Voltage	approx. 1V rms
Output Level Deviation	±1 dB
Sweep Method	LOG sweep
Sweep Range	3~20 sec. continuously variable (at 10 Hz~20 kHz sweep width)
Retrace Time	approx. 0.3 sec.
Sweep Mode	AUTO, MANUAL, REPEAT, SINGLE
Output Impedance	
Power Amplifier	
Band width	10 Hz~20 kHz, within ±0.5 dB
Maximum Output	12.5W/8Ω, 25W/4Ω
Output Range	3-range of 1V, 3V and 10V
Fo	
Measurement Range	20 Hz~20 kHz
Measurement Accuracy	±(5% + 1 Hz)
Indication	4-digit counter
Polarity	+/— LED Indication
Power Supply	AC 100, 120, 220, 240V, 50/60 Hz
Size and Weight	400(W) x 148(H) x 400(D) mm

Audio Compound

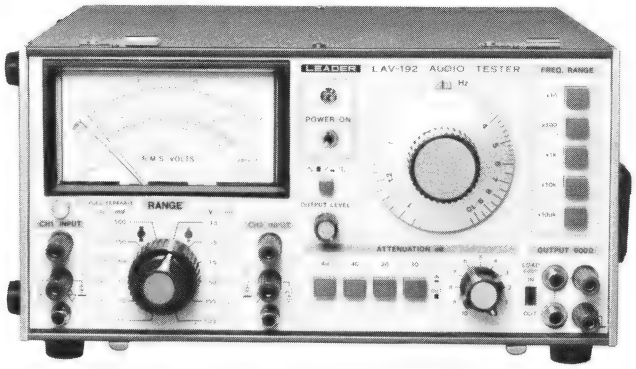
1CH AUDIO TESTER

LAV-191



2CH AUDIO TESTER

LAV-192



Generator 10Hz~1MHz / AC Millivoltmeter 150μV~500V / Attenuator 120dB

3 instruments in one !!

The LAV-191 and 192 are combinations of a wideband audio generator, an attenuator and a wide-range AC millivoltmeter (LAV-191 . . . 1CH, LAV-192 . . . 2CH).
These instruments are specially useful in testing and servicing audio circuits, monaural and stereo, for frequency response and gain characteristics, and besides, designed small and light-weight, LAV-191 and 192 are easy to carry.

■ FEATURES

- The LAV-191, 192 are equipped with built-in wideband audio generator, audio attenuator, and an AC millivoltmeter in one case.
- The audio generator has a frequency range from 10Hz to 1MHz, in 5 decade ranges, with distortion at less than 0.05%.
- The 2 channel AC millivoltmeter are provided for stereo circuit measurements (only LAV-192).
- In addition to the direct input, two switchable input — LEFT and RIGHT — are provided for stereo circuit measurements (only LAV-191)
- Can set the level of incoming signal at 0 dB and compare signal against standard signal in making measurement of SN ratio, etc. (only LAV-191)

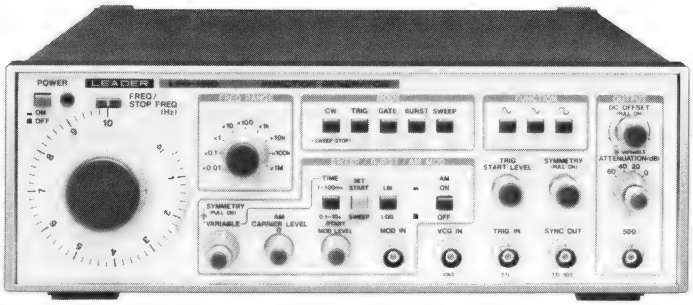
■ SPECIFICATIONS (Common to both the LAV-191, 192)

Audio Generator Section	
Frequency Range	10Hz ~ 1MHz 5 ranges Accuracy ± (3% + 1Hz)
Sine Wave Voltage Flatness Distortion (Max.) Impedance	 Over 3Vrms into 600Ω within ±0.5dB 0.05%; 500Hz ~ 20kHz 0.4%; 50Hz ~ 200kHz 0.8%; 20Hz ~ 500kHz 1.5%; 10Hz ~ 1MHz 600Ω Internal/External load
Square Wave	Output; Over 3Vp-p into 600Ω Rise Time; 200ns. Sag; 5% at 50Hz
Attenuator Section	
Attenuation Accuracy	0 ~ 120dB in 1dB steps at 600Ω; 40dB x 2, 20dB, 10dB, 1dB x 10. Within ±1.5%
Freq. Characteristics	0~60dB; 10Hz ~ 500kHz . ±0.5dB 10Hz ~ 1MHz . . ± 2dB 60~120dB; 10Hz ~ 150kHz . ±0.5dB 10Hz ~ 500kHz . ± 6dB 10Hz ~ 1MHz . . ± 10dB
AC Millivoltmeter Section	
Voltage Range Decibel Range	1.5mV ~ 500Vrms F.S. 12 ranges −80dB ~ +56dB (0dB = 0.775V) −80dB ~ +54dB (0dB = 1V)
Accuracy Bandwidth	Within ±2% of full scale at 1kHz 20Hz ~ 100kHz, within ±2% 10Hz ~ 1MHz within ±10%
Input Impedance	10MΩ
Amplifier Output Output Impedance Distortion	Approx. 1Vrms Approx. 600Ω ±20% Less than 2% at 1kHz, full scale
Power Supply Size and Weight	AC100, 120, 220, 240V, 50/60Hz, 8VA (LAV-191), 10VA (LAV-192) 300(W) x 150(H) x 250(D)mm 5.4kg (LAV-191), 5.9kg (LAV-192)
Accessories	Pin-plug ~ pin plug cable . . . . 2 Pin-plug ~ mini-plug cable . . . 1 Banana-tip ~ clip cable 2

Audio Generator

FUNCTION GENERATOR

LFG-1310



NEW

0.01Hz~10MHz

FIVE TYPES OF OUTPUT WAVEFORMS & OPERATIONAL MODES

The LFG-1310 Function Generator generates a variety of waveforms, including sine, square, triangle, ramp, and pulse signals over a frequency range of 0.01Hz to 10MHz.
Because it provides such different operation modes as continuous generation, gate generation, trigger generation, burst wave generation, and sweep generation, the LFG-1310 can be used for diverse applications — for example, for frequency characteristic measurement of audio/video equipment and in the testing of automatic control devices.

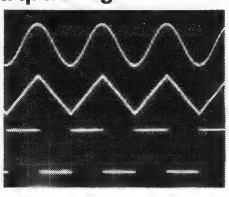
■ FEATURES

- Wide frequency range of 0.01Hz to 10MHz.
- Gate and trigger generations are possible.
  The LFG-1310 provides gate generation to supply signals for a fixed period of time, and trigger generation to supply signals for one cycle. The trigger points can be arbitrarily set.
- Burst waves can be generated by the built-in oscillator.
- Built-in linear/logarithmic sweep functions.
- VCG function for external control of output frequency.
- GCV function to generate a voltage in proportion to the frequency.
- Built-in amplitude modulation circuit with the suppressed-carrier mode.
- Variable waveform symmetry.
- DC offset function to superimpose DC voltage on output waveforms. In addition, DC voltage only can be obtained.

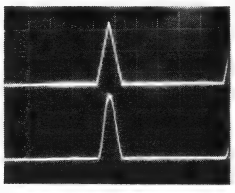
■ SPECIFICATIONS

Frequency Range Dial Accuracy	0.01Hz~10MHz, 9 ranges x0.01~x100k ranges, ±5% of full scale x1M range, ±10% of full scale
Output Signal	Sine wave, triangle wave, square wave, ramp wave, pulse wave
Sine Wave	Output Flatness: 0.01Hz~100kHz, ±0.3dB 100kHz~10MHz, ±1dB Distortion: 10Hz~50kHz less than 0.5%
Triangle Wave	Linearity Error: 1% at 100Hz
Square Wave	Rise/Fall Time: 25ns or less (with max. output)
Symmetry Variable	20:80~80:20 (0.01Hz to 1MHz)
Operation Mode CW	 Continuous generation
TRIG, GATE	TRIG: one cycle oscillation triggered by input signal GATE: oscillation only when input is HI. Frequency Range: 0.01Hz~1MHz Input Voltage: TTL Input Frequency: DC~100kHz Start/Stop Phase: variable
BURST	Burst wave oscillation for gate time of 1ms to 10s by built-in oscillator. ON/OFF time is symmetrical and variable.
SWEEP Sweep Mode	 LOG or LINEAR is selectable.
Sweep Rate	1ms~10s, 2 ranges, continuously variable Fly-back line interval is symmetrical and variable.
Sweep Width	Max. 1:100, continuously variable (sweep start frequency can be specified.)
Output Characteristics Output Level Attenuators Output Impedance DC Offset	 20Vp-p at no termination 0dB, 20dB, 40dB, 60dB continuously variable 50Ω±10% Maximum ±10V at no termination
SYNC Output	TTL level (duty cycle is symmetrical and variable.)
GCV Output	Voltage output in proportion to frequency 0 ~ +5V (max. frequency in each range)
Sweep Output	Sweep output in sweep mode 0 ~ −5V
Amplitude Modulation (AM)	Modulation level: 0~100% continuously variable Input Signal Level: Max. 5Vp-p Suppressed-carrier mode
External Frequency Control (VCG)	Freq. Range: Max. 1000:1, with frequency set to "10" Input Level: 0 to −5V (±20%) (frequency is decreased by negative voltage)
Power Supply Size and Weight Accessory	AC100, 120, 200, 220, 240V 50/60Hz 30VA 300(W) x 100(H) x 300(D)mm, approx. 3.5kg BNC~clip cable (50Ω) 1

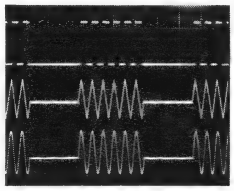
■ Output Signals



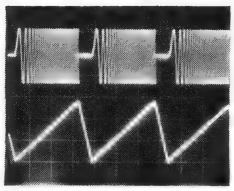
Sine, triangle, square wave



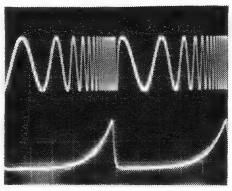
Haver triangle, Haver sine wave



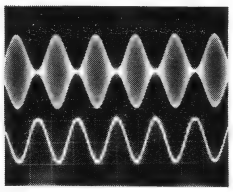
Gate wave



Gated sweep wave



Log sweep wave

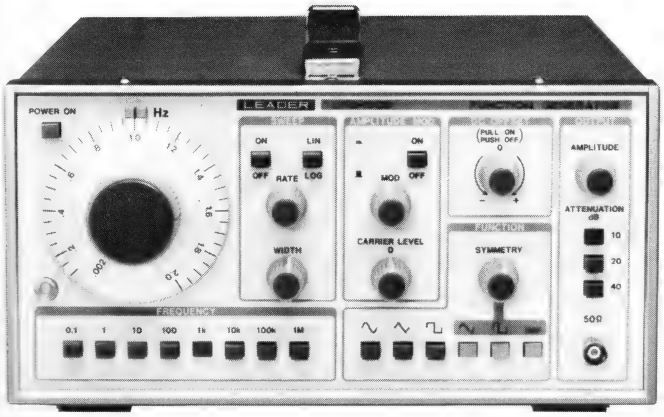


AM modulation wave

Audio Generator

FUNCTION GENERATOR

LFG-1300



0.002Hz~2MHz

The LFG-1300 is a multi-purpose function generator specially designed for generation of various waveforms with wide frequency range. The equipment has abundant functions, so that it has a wide range of applications in testing and adjustment of electronic devices and in research and development of wide areas such as medical science, physical geography, and automatic controls.

■ FEATURES

- Wide frequency range of oscillation, 0.002Hz to 2MHz.
- Low distortion factor, less than 0.5% (at 10Hz to 20kHz).
- Five types of output waveforms (with TTL output).
- Built-in sweep function with logarithmic and linear sweeping, and with variable sweep width and rate.
- Built-in AM modulator.
- DC offset function to superpose DC voltages on various waveforms.
- External sweep control (with VCG terminal).

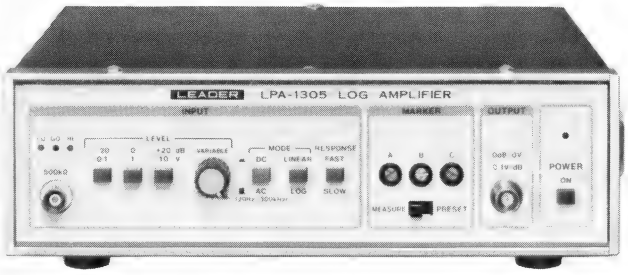
★ Built-in Sweep Function Logarithmic/Linear

■ SPECIFICATIONS

Frequency Range	0.002Hz ~ 2MHz in 8 decade ranges
Dial Accuracy	± (3% set value + 3% full scale) for 0.02Hz ~ 200kHz ± (5% set value + 5% full scale) for 200kHz ~ 2MHz
Output Signals	Sine, Triangle, Square, Pulse Sawtooth, DC, TTL output
Sine Wave Output Voltage Distortion	 20Vp-p (approx. 7Vrms) at no termination Less than 0.5% for 10Hz ~ 20kHz
Triangle Wave Output Voltage Symmetry	 20Vp-p at no termination Less than 1% for 0.02Hz ~ 100kHz
Square Wave Output Voltage Symmetry Rise Time	 20Vp-p at no termination Less than 1% for 0.02Hz ~ 100kHz Less than 100ns
Pulse/Sawtooth Wave	Symmetry is continuously variable 1:1 ~ 1 : 40 by the symmetry adjustment knob (with polarity inversion switch).
TTL Output Fan Out Output Level	 20TTL 2.4V ~ 5V for H , 0 ~ 0.4V for L
DC	Any level within ±10V by DC OFFSET
DC OFFSET	−10V ~ +10V Clipping level for superposed waveform: ±10V
Sweep Sweep Mode Sweep Rate	 LOG. or LINEAR is selectable Continuously variable, 20ms (50Hz) ~ 5s (0.2Hz)
Sweep Width	Continuously variable, 10:1 ~ 1000:1 of frequency ratio
AM Modulation Modulation Modulation Signal	 Continuously variable, 0% ~ 95% or more External input Carrier suppress function is available
Output Terminal Output Impedance Attenuators Accuracy	 50Ω ± 5% 10dB, 20dB, and 40dB Max. 70 dB ±1% of set value for less than 200kHz ±2% of set value for 200kHz and above
Rear Panel Terminals	GCV OUT, VCG IN, MOD IN, TTL OUT, H. OUT
Size and Weight	250(W) x 125(H) x 250(D)mm, 4kg approx.
Power Supply Accessories Optional Accessory	AC100, 120, 220, 240V is available by the voltage selector on the rear panel A connection cable LC-2048 (BNC 50Ω Instruction manual) Terminator LT-2049 50Ω (Separately available).

LOG AMPLIFIER

LPA-1305



The LPA-1305 Log Amplifier with built-in detector has been specially designed to be used for frequency characteristics monitoring in combination with the LFG-1300 Sweep Function Generator.
The LPA-1305 works as a logarithmic amplifier for DC input, not only for AC input. Three points of frequency markers are provided.

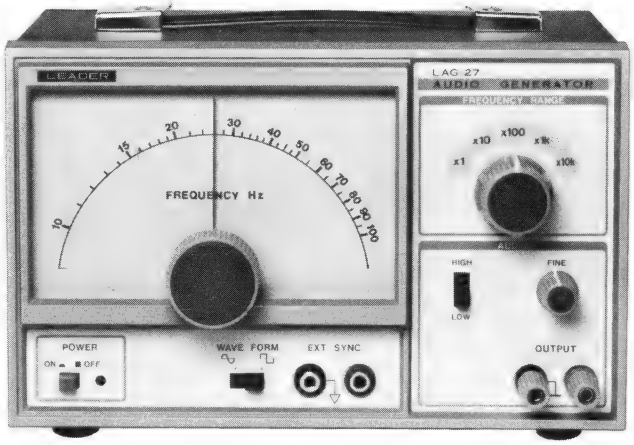
■ SPECIFICATIONS

Input Voltage Range	1mV ~ 100V (−70dBV ~ +40dBV)	AC/DC
Frequency Range	20Hz ~ 300kHz	AC
Input Range	0.1V (−20dB), 1V (0dB), 10V (+20dB)	AC/DC
Linearity	LOG: ±1 dB LINEAR: ±3% of F.S. } at 1kHz	AC/DC
Frequency Response	20Hz ~ 30kHz ±0.5 dB	AC
Frequency Marker	Input Terminal; GCV or H.IN	
Power Supply	AC100, 120, 220, 240V 50/60Hz 18VA	
Size and Weight	250(W) x 75(H) x 250(D)mm, 4kg	

Audio

AUDIO GENERATORS

LAG-27



LAG-120A

10Hz ~ 1MHz, 5Ranges

The LAG-27 is a handy generator of signals in the audio, supersonic and radio frequency ranges. It generates two types of waveforms, sine for general testing and square for transient response testing.
Using thick film integrated circuit (IC), synchronizing with an external frequency source, 600Ω output impedance and compact construction are featured in this instrument.

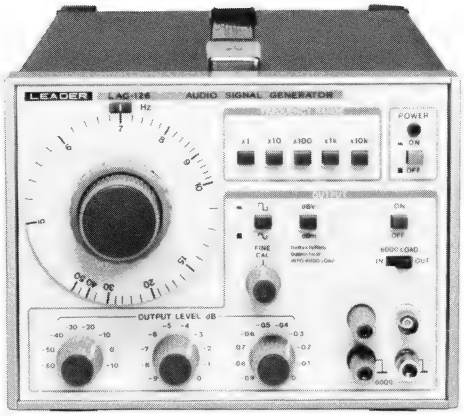
- For a wide-band from 10kHz to 1 MHz.
- The push-button type switch is used for quick frequency range selection.
- Low distortion of 0.05%.
- Equipped with a 10dB x 5 continuously variable attenuator.

■ SPECIFICATIONS

MODEL	LAG-27	LAG-120A
Frequency Range Frequency Accuracy	10Hz ~ 1MHz, 5 ranges 10Hz ~ 1MHz: ± (5% + 2Hz) 100Hz ~ 100kHz: ± (3% + 2Hz)	10Hz ~ 1MHz, 5 ranges ± (3% + 1Hz)
Output Waveforms Sine Wave Frequency Range Output Voltage Output Distortion	 10Hz ~ 1MHz More than 5 Vrms (no load) Less than 0.5% (200Hz ~ 100kHz) Less than 1% (100Hz ~ 500kHz) Less than 2% (10Hz ~ 1MHz)	 10Hz ~ 1MHz More than 3Vrms into 600Ω 0.05% (500Hz ~ 20kHz) 0.4% (50Hz ~ 200kHz) 0.8% (20Hz ~ 500kHz) 1.5% (10Hz ~ 1MHz)
Square Wave Frequency Range Output Voltage Rise Time Sag	 10Hz ~ 100kHz More than 5Vp-p (no load) Less than 200ns Less than 5%	 10Hz ~ 1MHz 3Vp-p into 600Ω 200ns 5% at 50Hz
Output Impedance Output Flatness Output Attenuator	approx. 600Ω Within ± 1.5dB HIGH, LOW(40dB), and continuous adjuster	600Ω ± 10% Within ± 0.5dB into 600Ω 6-step attenuation and continuous adjuster
Sync. Signal Terminal Input Impedance Synchronization Range	 approx. 10kΩ ± 1% / V	 approx. 10kΩ ± 1% / V
Power Supply	AC100, 115 ~ 120, 220 ~ 240V	AC100, 120, 220,240V 50/60Hz, 6.5VA approx.
Size and Weight	238(W) x 150(H) x 130(D)mm 2.5kg	132(W) x 150(H) x 250(D)mm 3kg
Accessory		LT-2044 600Ω Terminator..... 1

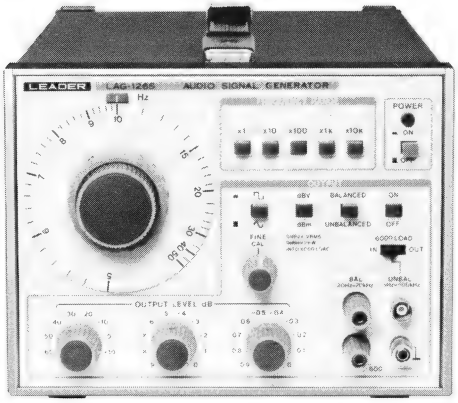
LOW DISTORTION AUDIO GENERATORS

LAG-126



5Hz ~ 500kHz Unbalanced Output

LAG-126S



5Hz ~ 500kHz Unbalanced and Balanced Output

This is a CR signal generator designed to supply sine waves having an extra-low distortion factor over the frequency range of 5Hz to 500kHz. The instrument's output voltage is calibrated in dBm (1 mW, 600 ohms) and dBV (0 dB = 1 Vrms), and 0.1 dB, 1 dB and 10 dB step attenuators ensure that it provides standard output. The **LAG-126** delivers unbalanced output only. The **LAG-126S** delivers both unbalanced and balanced output voltages which can be switched over from one to the other.

■ FEATURES

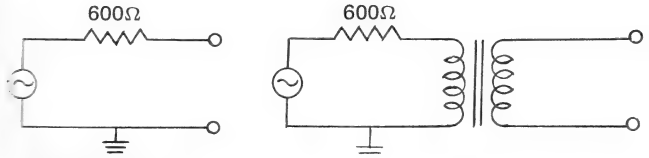
- An extra-low distortion factor of 0.005%.
- 10 dB, 1 dB and 0.1 dB step attenuators and a fine adjuster are provided.
- Output voltage can be switched over between the dBm and dBV.
- Square waves can also be supplied.
- An output turn-off function, useful for S/N measurement, is provided.
- Balanced output can also be delivered (LAG-126S only).

■ The relations between the switch (changing over the dBV and dBm) and output volts.

Switch position	Output voltage when terminated at 600Ω
dBV	0dB = 1Vrms
dBm	0dB = 0.775Vrms

0dBm: 1mW, 600Ω

■ Balanced/Unbalanced Output



Unbalanced Output
Common to both the LAG-126 and LAG-126S

Balanced Output
Only LAG-126S

■ SPECIFICATIONS (Common to both the LAG-126, 126S)

Frequency Range	5Hz~500kHz, 20Hz~20kHz at balanced output, 5 ranges
Frequency Accuracy	± (3% + 1Hz)
Output Waveform	Sine & square waves selectable by a switch
Sine Wave Maximum Output Voltage	+10dB±0.3dB when terminated at 600Ω, with a dBm-dBV changeover switch
Distortion Factor Unbalanced Output	Less than 0.005%: 20Hz~20kHz Less than 0.01%: 10Hz~50kHz Less than 0.1%: 5Hz~500kHz
Balanced Output (LAG-126S only)	Less than 0.01%: 500Hz~20kHz Less than 1.5%: 20Hz~500Hz
Level Flatness Unbalanced Output	±0.2dB: 5Hz~20kHz ±0.5dB: 20kHz~500kHz
Balanced Output (LAG-126S only)	±0.5dB: 20Hz~20kHz
Square Wave Maximum Output Voltage	Approx. 4Vp-p (when terminated at 600Ω and the output is dBV)
Rise Time	Less than 200ns
Overshoot	Less than 5% at higher than –30dBV output
Sag	Less than 5% ..... +V 0
Attenuator	10dBx7, 1dBx9 and 0.1dBx9, with a fine adjuster (for the sine wave only) and an output turn-off function
Output Impedance Unbalanced	600Ω ± 3%
Balanced (LAG-126S only)	600Ω ± 10%
Power Supply	AC100V, 50/60Hz, approx. 13VA (changeable to 120V, 200V, 220V and 240V by selecting taps of the internal transformer)
Size and Weight	200(W) x 150(H) x 250(D)mm Approx. 3.2kg (LAG-126), 3.5kg (LAG-126S)
Accessory	BNC clip cable..... 1

Audio Wow & Flutter

WOW & FLUTTER METERS

LFM-3610

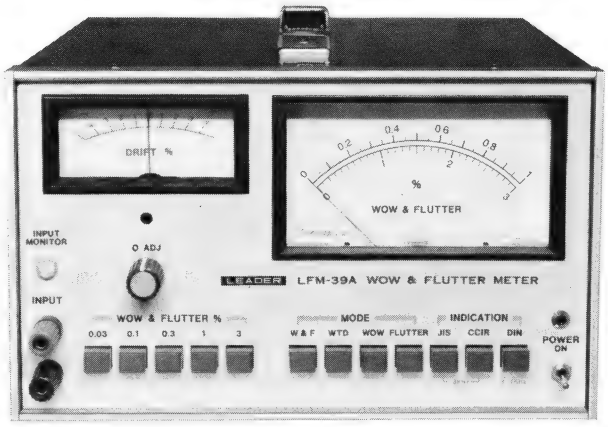
JIS · CCIR · DIN, 0.03~3% F. S.

The LFM-3610 Wow & Flutter Meter is a direct reading type instrument designed for measurement of Wow, Flutter and Drift characteristics of tape recorders, record players and other playback/recording equipment. The effective values, peak-to-peak values and center frequency (3kHz or 3.15kHz) or Wow & Flutter are indicated on the meter in accordance with JIS, CCIR, DIN, and weighted specification.

■ SPECIFICATIONS

Input Frequency		JIS/CCIR 3kHz±10% DIN 3.15kHz±10%
Input Voltage Range		50mV~5Vrms
Input Impedance		Over 300kΩ
Drift Measurement		
Range		±5%
Accuracy		Within ±5% of full scale
WOW & Flutter Measurement		
Range		5 ranges: 0.03%, 0.1%, 0.3%, 1%, and 3%
Accuracy		Within ± 8% of full scale
WOW & Flutter Frequency Characteristics		
W & F		JIS: 0.5~200Hz (−3dB±1.5dB) CCIR: 0.3~200Hz (−3dB±1.5dB) DIN: 0.3~300Hz (−3dB±1.5dB)
Weighted		In accordance with JIS, CCIR and DIN specifications
Wow	DIN, CCIR	0.3Hz~6Hz (−3dB±1.5dB)
	JIS	0.5Hz~6Hz (−3dB±1.5dB)
Flutter	JIS, CCIR	6Hz~200Hz (−3dB±1.5dB) 6Hz~ 50Hz (−3dB±1 dB) 50Hz~200Hz (−3dB±1 dB)
	DIN	6Hz~300Hz (−3dB±1.5dB) 6Hz~ 50Hz (−3dB±1.5dB) 50Hz~300Hz (−3dB±1.5dB)
Indication		JIS: Effective Value CCIR/DIN: peak value
Output Terminal		
Recording		JIS, CCIR...3kHz, DIN...3.15kHz
Freq. Accuracy		5×10^{-4} (crystal controlled)
Output Voltage		0.5Vrms approx.
Power Supply		AC100, 120, 220, 240V, 50/60Hz 15VA
Size and Weight		200(W) x 98(H) x 300(D)mm, 2.5kg
Accessories		Pin-plug~Pin-plug cable.....1 Pin-plug~Clip cable 1

LFM-39A



3kHz (JIS, CCIR) 3.15kHz (DIN) 0.03% F. S.

The LFM-39A Wow & Flutter Meter is a direct reading type instrument designed for measurement of Wow, Flutter and Drift characteristics of tape recorders, record-players and other playback/recording equipment. The RMS values, peak-to-peak values and center frequency (3kHz or 3.15kHz) of Wow & Flutter are indicated on the meter in accordance with JIS, CCIR, DIN, and weighted specification.

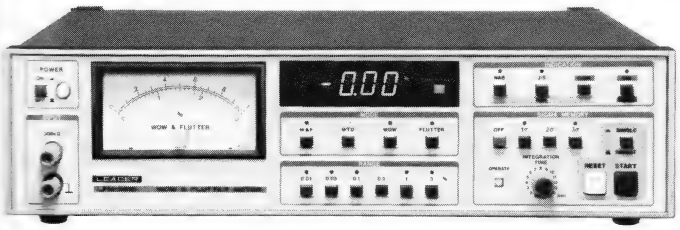
■ SPECIFICATIONS

Input Frequency	JIS/CCIR 3kHz ± 10% DIN 3.15kHz ± 10%
Input Voltage Range	15mV ~ 10Vrms
Input Impedance	Over 300kΩ
Drift Measurement	
Range	±5%
Accuracy	Within ± 5% of full scale
Wow & Flutter Measurement	
Range	5 ranges: 0.03%, 0.1%, 0.3%, 1% and 3%
Accuracy	Within ± 5% of full scale
Wow & Flutter Frequency Characteristics	
W & F	JIS: 0.5~200Hz (−3dB±1dB) CCIR: 0.3~200Hz (−3dB±1dB) DIN: 0.3~300Hz (−3dB±1dB)
Weighted	In accordance with JIS, CCIR and DIN specifications
Wow	JIS: 0.5~6Hz (−3dB±1dB) CCIR/DIN: 0.3~6Hz (−3dB±1dB)
Flutter	JIS/CCIR: 6~200Hz (−3dB±1dB) DIN: 6~300Hz (−3dB±1dB)
Indicating System	JIS: RMS Value CCIR/DIN: peak to peak value
Output Terminal	
Recording/Playback Test Signal Output	Oscillator frequency ..... 3kHz ± 0.05% Output voltage ..... 0.3Vrms ± 10% Distortion ..... Less than 2%
Recorder Output To Scope Terminal	Output Voltage ..... F.S. IV ± 5% Output Voltage ..... F.S. IV ± 5%
Power Supply	AC 100, 120, 220, 240, 50/60Hz 15VA
Size and Weight	250(W) x 150(H) x 250(D)mm; 4.5kg
Accessory	Connection cable 1

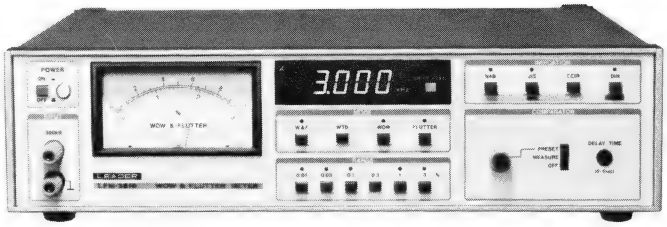
Audio Wow & Flutter

WOW & FLUTTER METERS

LFM-3615



LFM-3616



Sigma Memory Function

- The LFM-3615, 3616 are wow/flutter meters which can measure wow/flutter characteristics of various recording/playing devices in high sensitivity (0.01% of full scale) according to the NAB, JIS, CCIR, and DIN standards.
- Further, since the instrument is provided with the counter, simultaneously with measurement of wow/flutter, a tape speed in a frequency (kHz) or in its deviation (%) against 3kHz and 3.15kHz can be displayed. • A wide range of wow/flutter measurement is available from the 0.01% range to 3% range.
- The peak value indication at the center frequency of 3.15kHz in accordance with the DIN standard, peak value indication at the center frequency of 3kHz in accordance with the CCIR standard, effective value indication in accordance with the JIS standard, and mean value indication in accordance with the NAB standard are available.

Analog Comparator Function

- In measurements of the CCIR and DIN standards, since the instrument has the sigma memory function for processing the wow/flutter in a predetermined time frame in accordance with the standard deviation (σ), the meter reading can be made in the static condition. (LFM-3615 only)
- In the sigma mode of operation, either one of 1σ, 2σ, or 3σ can be selected. (LFM-3615 only)
- An analog comparator is built in for the wow/flutter indication, and thus good/no good judgement of wow/flutter characteristics can be rapidly made by the GO/NO LED's to improve the productivity of the production line. (LFM-3616 only)

■ SPECIFICATIONS (Common to both the LFM-3615 and LFM-3616)

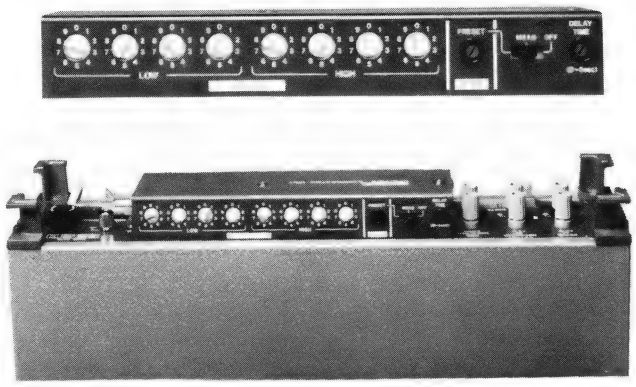
Wow & Flutter Measurement	
Measurement Center Freq.	JIS, NAB and CCIR .....3kHz ±10% DIN .....3.15kHz ±10%
Input Level Range	15mV ~ 10Vrms (0.03% ~ 3% range) 100mV ~ 10Vrms (0.01% range)
Input Impedance	300kΩ or higher
Measurement Range	0.01, 0.03, 0.1, 0.3, 1 and 3% 6 full-scale ranges
Indication Accuracy	Within ±5% of full scale
Indication Mode	JIS... effective value, NAB ... mean value CCIR, DIN ... peak value
Frequency Response W & F	JIS & NAB ...0.5 ~ 200Hz (−3dB±1dB) CCIR .....0.3 ~ 200Hz (−3dB±1dB) DIN .....0.3 ~ 300Hz (−3dB±1dB)
Weighted	Common specification to all JIS, NAB, CCIR and DIN
Wow	JIS and NAB .....0.5 ~ 6Hz (−3dB±1dB) CCIR and DIN...0.3 ~ 6Hz (−3dB±1dB)
Flutter	JIS, NAB and CCIR ..... 6 ~ 200Hz (−3dB±1dB) DIN ..... 6 ~ 300Hz (−3dB±1dB)
Dynamic Response JIS	Time required for a predetermined input to reach 95% of indication against 100% full scale: 3.5sec ±1sec
NAB	Conforming to the NAB standard
CCIR	Conforming to the CCIR standard
DIN	Conforming to the DIN standard
Measurement Using Sigma Memory	LFM-3615 only (only for CCIR and DIN)
Starting	Single and repeat
Sigma Mode	1σ, 2σ and 3σ switchable
Measurement Time	1 ~ 15sec in single-second step, crystal oscillator control
Operation Preparation Time	Approx. 1 second

Output Terminals	
To SCOPE Terminal	Output voltage 1Vrms ±5% at full scale
Output Signal for Recording/Playing Test	Output frequency 3kHz and 3.15kHz, Accuracy 3 x 10^{-5}, output voltage 0.3Vrms ±20%
RECORDER Output	Output voltage 1V DC ±5% at full scale
Analog Comparator	LFM-3616 only
Preset	Continuous variable setting by meter indication
Judgement Delay Time	0 ~ 5sec, arbitrary setting
Judgement Indication	NO (red) and GO (green) indication by LED's
Tape Speed and Drift Measurement	
Input Level Range	15mV ~ 10Vrms (1kHz ~ 5kHz) 100mV ~ 10Vrms (10Hz ~ 9.999kHz)
Input Impedance	300kΩ or more
Reference Time Freq.	378kHz (crystal oscillation control), accuracy 3 x 10^{-5}
Tape Speed Measurement	(in kHz)
Frequency Range	10Hz ~ 9.999kHz
Gate Time	1 second
Indication Accuracy	±1 count ±reference time diviation
Drift Measurement	(in %)
Reference Frequency	3kHz and 3.15kHz
Measurement Range	−9.99% ~ +9.99%
Gate Time	3.33 seconds (3kHz), 3.17 seconds (3.15kHz)
Indication Accuracy	±2 counts ±reference time deviation
Output Terminal	Coding by 4-digit positive logic BCD
External Control Input	MODE, RANGE, INDICATION, REMOTE/LOCAL
Control Input Signal	Negative logic TTL level, 1 TTL
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 20VA
Size and Weight	400(W) x 100(H) x 300(D)mm, 4.5kg

Audio Wow & Flutter

WOW · FLUTTER METER COMPARATOR UNIT

LFM-3615-01



Judgment : GO, NO Indication

The LFM-3615-01 is a comparator used, together with the LFM-3615 wow/flutter meter, to make GO/NO GO (good/no good) judgment on measured wow/flutter and tape speed of various recording/playing devices in accordance with preset reference values.
In combination with the LFM-3616 wow/flutter meter (which has a built-in comparator for GO/NO GO judgment of wow/ flutter), the LFM-3615-01 offers the ability to judge propriety of tape speed.

■ SPECIFICATIONS

Tape Speed Comparator Section	
Input	4-digit BCD, 5V (CMOS level) positive logic
Presetting Method	Upper/lower limit values set by digital swiches in 4-figure number respectively
Presetting Limit-Value Range	Upper O ~ 9999Hz Lower O ~ 9999Hz
Judgment Frequency Range	Same as the frequency range for the wow/flutter measurement of the LFM-3615/LFM-3616
Judgment Result Display	Indicated by LO (red), GO (green), or HI (red) lamp on the front panel of the LFM-3615/LFM-3616
Wow/Flutter Comparator Section	
Input Method	Analog signal input from the LFM-3615
Presetting Method	Applying the meter of the LFM-3615
Presetting Reference Value Range	Same as the measurement range of the LFM-3615
Judgment Result Display	Indicated by GO (green) or NO (red) lamp on the front panel of the LFM-3615
Judgment Delay Time	Selected in the range from 0 sec. to 5 sec. (continuously variable)
Power Supply	Supplied from the LFM-3615/LFM-3616 connected
Size	206(W) x 54(H) x 30(D)mm
Weight	0.3kg
Accessories	Connection cable (flat cable with 34p connector) . . . . . 1 Fixing screw . . . . . 2 Instruction manual 1

BTL ADAPTOR

LBA-1810

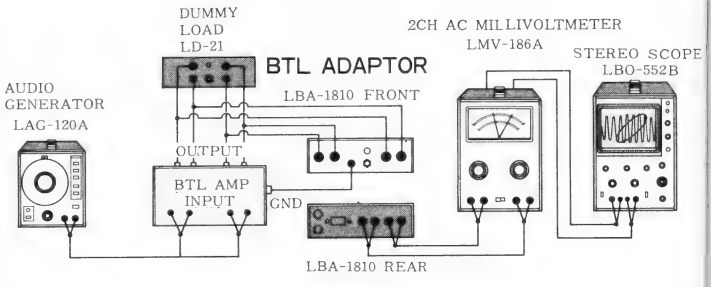
BTL AMP. measurement made easier

The LBA-1810 is a balanced-to-unbalanced converter adaptor of no insertion loss (gain 0dB) for 2 channel AC voltmeter, providing accurate measurement of BTL AMP being used with high power car stereos and power boosters.
By setting the unit between the BTL Amp. and 2CH AC millivoltmeter, the BTL Amp. → BTL Adaptor (LBA-1810) → 2CH AC millivoltmeter →stereoscope connections will become possible and accurate measurement can be performed quickly with one 2CH AC millivoltmeter and one oscilloscope.

■ SPECIFICATIONS

Measurement Frequency Range	10Hz ~ 20kHz ±0.1dB 3Hz ~ 100kHz ±0.5dB
Max. Input Voltage	10Vrms (4Ω 25W) 10Hz ~ 100kHz
Residual Noise	Less than 40 μV
Input Impedance	Approx. 150kΩ, Input capacity less than 20pF
Input Terminal	Binding post
Gain	0dB (±0.1dB) at 1kHz
Output Impedance	Approx. 600Ω
Output Terminal	Binding post
Size and Weight	150(W) x 45(H) x 270(D)mm, approx. 1.3kg
Accessories	Pair plug ~ pair plug 2

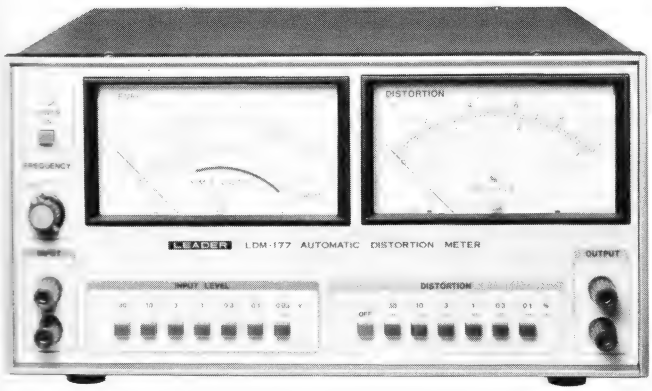
■ APPLICATION



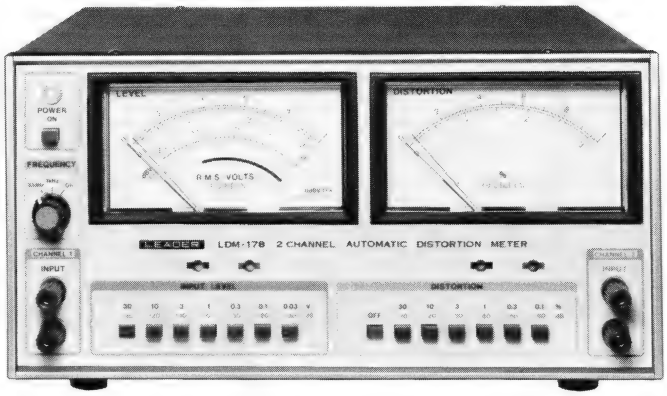
Audio Distortion

AUTOMATIC DISTORTION METERS

LDM-177(1CH)



LDM-178(2CH)



High-Pass Filter System 3-Point Spot, Automatic Level Control

LDM-178 FITS FOR DISTORTION AND LEVEL MEASUREMENTS. IT MEASURES 2 CHANNELS OF STEREO TAPE DECK SIMULTANEOUSLY.

Measurement Frequency
315Hz, 1kHz
(Optional : 333Hz, 400Hz, 3kHz)

The LDM-177 is a 1-channel type high-pass filter system 3-point spot distortion meter, and the LDM-178 a 2-channel type, 1 point of which is optional.
An automatic level control is adopted for measuring the distortion of tape recorders. The high-pass distortion meter allows accurate measurements of distortions of waveforms having wow and flutter.
Aside from the 315 Hz and 1 kHz, another measurement frequency can be optionally selected one point of 333 Hz, 400 Hz and 3 kHz. A level meter is installed to provide simultaneous readings of output level together with the distortion measurements. The units also have filter output terminals for monitoring harmonic components.

■ FEATURES

- Automatic level control circuit eliminates full scale setting against measurement level fluctuations.
- Optional selection of a measurement frequency of 333 Hz, 400 Hz and 3 kHz available besides the 315 Hz and 1 kHz.
- Level meter provides reading of output level measurement at the same time with the distortion measurement.
- Filter output terminal enables monitoring of harmonic components by connecting with oscilloscope.

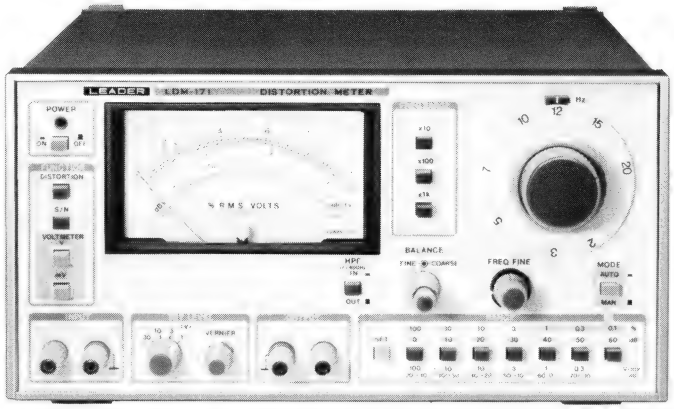
■ SPECIFICATIONS

Distortion Measurements	
Measurement Frequency	
Range	315 Hz ±5%, 1 kHz ±5%
Optional	1 Point of 333 Hz, 400 Hz and 3 kHz
Measurement Distortion	
Range	0.03% ~ 30%
Measurement Range	0.1, 0.3, 1, 3, 10, 30% 6 Ranges
Input Level Range	10mV ~ 30V
Automatic Level Control Range	10dB
Input Impedance	100kΩ Unbalanced
Measurement Accuracy	Within ±5% of full scale (However, ±10% of full scale for 0.1% range)
Fundamental Frequency Suppression	More than −76dB
Level Measurement	
Input Impedance	100kΩ Unbalanced
Input Capacitance	Less than 70pF
Measurement Level Range	3mV ~ 30V
Measurement Range	0.03, 0.1, 0.3, 1, 3, 10, 30V 7 Ranges
Measurement Frequency Range	20Hz ~ 30kHz Within ±0.5dB 20Hz ~ 20kHz Within ±0.5dB (0.03V Range)
Measurement Accuracy	Within ±5% of full scale
Output Terminals	
Level Monitor	1V ±5% (at full scale)
Filter Output	1V ±5% (at full scale)
Power Supply	AC 100, 120, 220, 240V, 50/60Hz
Power Consumption	LDM-177 ... 10VA, LDM-178 ... 20VA
Size	300(W) x 150(H) x 400(D)mm
Weight	LDM-177 approx. 7kg, LDM-178 approx. 8kg
Accessories	Pair Plug ~ Clip cable (LC-2021) ... 1 (LDM-177), ... 2 (LDM-178)

Audio Distortion

DISTORTION METER

LDM-171



NEW

20Hz~20kHz, 0.1% F. S.

The LDM-171 is an easy-to-use, semi-automatic distortion meter that can measure all total harmonic distortion in audio amplifiers and communications equipment. It covers the entire audio band from 20Hz to 20kHz with a high sensitivity of 0.1% fullscale.
An auto-tuning circuit enables distortion to be measured easily even in the 1% and lower ranges, where manual tuning is difficult.
A highly sensitive built-in millivoltmeter enables the LDM-171 to function also as a signal-to-noise (S/N) meter.

■ SPECIFICATIONS

Distortion Measurement	
Frequency Range	3 ranges 20Hz~20kHz (fundamental)
Range	7 ranges: 0.1, 0.3, 1, 3, 10, 30 and 100%
Input Voltage Range	4 ranges: 0.35~1V, 1~3V, 3~10V, 10~30V
Min./Max. Measurable Input Voltage	350mV/30V
Measurement Accuracy	±5% of full scale (except in 100% range)
Residual Distortion	0.01% max.
Input Impedance	Approx. 100kΩ shunt capacitance 80pF max.
Filter Characteristics	Fundamental Suppression: 80dB min. Harmonic Attenuation: 0.6dB max. (2nd and 3rd harmonics)
Auto-Tuning	Capture ranges: 1%, 0.3%, 0.1%
Level Measurement	
Frequency Range	20Hz~200kHz
Measurement Range	6 ranges (0.3, 1, 3, 10, 30 and 100) in both mV and V
Measurement Accuracy	±5% at full scale
Input Impedance	1MΩ shunt capacitance 50pF max.
S/N Measurement	
Measurement Range	0~80dB
Input Voltage Range	4 ranges: 0.35~1V, 1~3V, 3~10V, 10~30V
Input Impedance	100kΩ shunt capacitance 80pF max.
Highpass Filter	Cutoff Frequency: 400Hz, Rolloff: 12dB/oct
Monitor Output	Approx. 1Vrms at full scale reading; output impedance, approx. 1kΩ
Power Supply	AC100, 120, 200, 240V 50/60Hz
Size and Weight	300(W) x 150(H) x 250(D) mm
Accessory	Banana-tip ~ clip cable 1

AUDIO ATTENUATOR

LAT-45

Max. 101dB, 0.1dB STEPS

The LAT-45 is designed for use in laboratories, plants and service shops where accurate results are required in measurements of audio equipment.
They are useful in determination of power levels and gain-loss characteristics in amplifiers and filters, and for control of voltage or power.

■ SPECIFICATIONS

Attenuation Range	0 ~ 101dB in 0.1dB steps
Accuracy	Within ±2% at 1kHz
Input/Output Impedance	600Ω; Unbalanced
Frequency Response	DC ~ 100kHz (70dB) DC ~ 50kHz (101dB)
Internal Termination	Open, or 600Ω, switched
Maximum Input	0.5W (17Vrms or DC, or +27 dBm)
Size and Weight	300(W) x 100(H) x 150(D)mm; 2kg approx.

Audio Level Meter

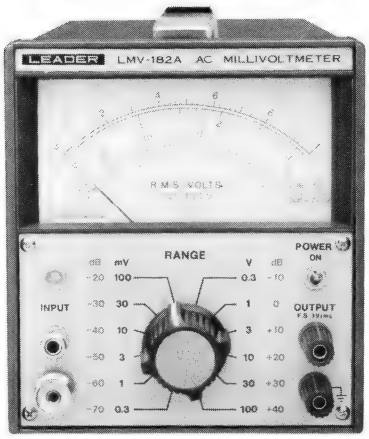
AC MILLIVOLTMETERS

LMV-181A [B]

1mV [1.5mV] F.S.

This instrument is a millivoltmeter and voltmeter with average responding device that offer r.m.s. value calibration, and are used for measuring sine wave alternating current voltages of 100μV ~ 300V [150μV ~ 500V] in the 5Hz ~ 1MHz frequency range.

LMV-182A [B]



300μV [500μV] F.S.

This instrument is a millivoltmeter and voltmeter with average responding that offer value calibration, and are used for measuring sine wave alternating current voltages of 30μV ~ 100V [50μV ~ 150V] in the 5Hz ~ 1MHz frequency range.

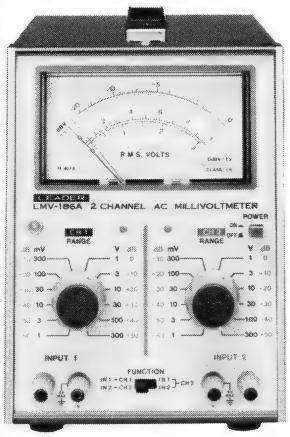
■ SPECIFICATIONS

MODEL	LMV – 181A, 181B	LMV –182A, 182B
Voltage Range	100μV ~ 300Vrms in 12 full scale ranges 181A 1, 3, 10, 30, 100, 300mV 1, 3, 10, 30, 100, 300V	30μV ~ 100Vrms in 12 full scale ranges 182A 0.3, 1.3, 10, 30, 100mV 0.3, 1, 3, 10, 30, 100V
	150μV ~ 500Vrms in 12 full scale ranges 181B 1.5, 5, 15, 50, 150, 500mV 1.5, 5, 15, 20, 150, 500V	50μV ~ 150Vrms in 12 full scale ranges 182B 0.5, 1.5, 5, 15, 50 150mV 0.5, 1.5, 5, 15, 50, 150V
Decibel Range	–80dB ~ +52dB (0dB = 0.775V) –80dB ~ +50dB (0dB = 1V) ... 181A	–90dB ~ +42dB (0dB = 0.775V) –90dB ~ +40dB (0dB = 1V) ... 182A
	–80dB ~ +56dB (0dB = 0.775V) –80dB ~ +54dB (0dB = 1V) ... 181B	–90dB ~ +46dB (0dB = 0.775V) –90dB ~ +44dB (0dB = 1V) ... 182B
Accuracy	± 2% of full scale to 1kHz	± 2% of full scale to 1kHz
Bandwidth (reference 1 kHz)	5Hz ~ 1MHz : ± 10% 10Hz ~ 500kHz : ± 5% 20Hz ~ 100kHz : ± 2%	5Hz ~ 1MHz : ± 10% 10Hz ~ 500kHz : ± 5% 20Hz ~ 100kHz : ± 2%
Input Impedance	10MΩ on all ranges shunt capacitance. 50pF : 1 ~ 300mV [1.5~500mV] range 35pF : 1 ~ 300V [1.5~500V] range	10MΩ on all ranges shunt capacitance. 50pF : 0.3 ~ 100mV [0.5~150mV] range 35pF : 0.3 ~ 300V [0.5~150V] range
Amplifier Output Voltage Impedance Bandwidth	 Approx. 1Vrms at full scale on each range 600Ω ± 20% 10Hz ~ 500kHz –3dB (1kHz as base)	 Approx. 1Vrms at full scale on each range 600Ω ± 20% 10Hz ~ 500kHz –3dB (1kHz as base)
Power Supply	AC100, 120, 200, 220, 240V 50/60Hz, 2.5VA approx.	AC100, 120, 200, 220, 240V 50/60Hz, 2.5VA approx.
Size and Weight	132(W) x 150(H) x 200(D)mm 2kg approx.	132(W) x 150(H) x 200(D)mm 2kg approx.
Accessories	Pair-plug ~ clip cable ..... 1 Terminal adaptor 1	Pair-plug ~ clip cable ..... 1 Terminal adaptor 1

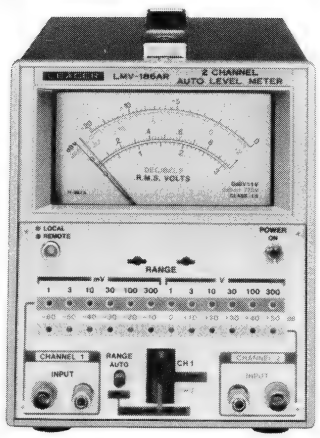
Audio Level Meter

DUAL CHANNEL AC LEVEL METERS

LMV-186A [B]



LMV-186AR



100 μV~300V, 5Hz~500kHz

- Two measurement voltages can be compared easily as they are indicated on a same scale.
- Two channel ranges can be switched independently or collectively, thus the equipment has a wide area of use.

Automatic 100 μV~300V

- Measurement ranges can be switched automatically according to an input level by the automatic range function.
- Any desired range setting is available in hold condition.
- The equipment has remote control terminals. Range switching is possible at hand by a separately available control box.

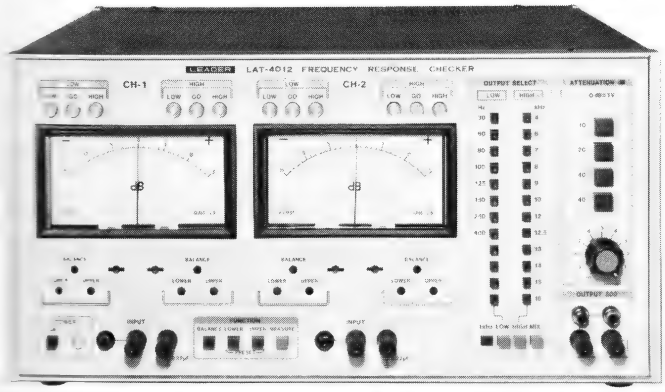
■ SPECIFICATIONS

MODEL	LMV-186A [B]	LMV-186AR
Voltage Meter Measuring Voltage Range	100μV ~ 300V [150μV ~ 500V] 12 Ranges	100μV ~ 300V 12 Ranges
Measuring Decibel Range (12 Ranges)	–60, –50, –40, –30, –20, –10dB 0, +10, +20, +30, +40, +50dB (0dB = 1V, 0dB = 0.775V)	–60, –50, –40, –30, –20, –10dB 0, +10, +20, +30, +40, +50dB (0dB = 1V, 0dB = 0.775V)
Measuring Accuracy	± 2% of full scale (at 1kHz or 400Hz)	± 2% of full scale (at 1kHz or 400Hz)
Frequency Response (Reference 1kHz)	5Hz ~ 500kHz ± 10% 10Hz ~ 200kHz ± 5% 20Hz ~ 100kHz ± 3%	10Hz ~ 500kHz ± 10% 20Hz ~ 200kHz ± 5% 30Hz ~ 100kHz ± 3%
Input Resistance Input Capacitance Max. Input Voltage	10MΩ Within 25pF or 45pF AC peak + DC = 600V	10MΩ Within 25pF or 45pF AC peak + DC = 600V
Noise	Within 2% of full scale by shortening input	Within 2% of full scale by shortening input
Amplifier Output Voltage Frequency Response	1Vrms at F.S. 10Hz ~ 300kHz –3dB (1kHz as base)	1Vrms at F.S. 10Hz ~ 300kHz –3dB (1kHz as base)
Output Impedance Distortion Factor	600Ω ± 20% Within 1% at F.S. (1kHz)	600Ω ± 20% Within 1% at F.S. (1kHz)
Range Switching Remote Control Signal	Manual	Auto, Hold, Remote 5V
Operating Temp. Range Power Supply	0°C ~ 40°C AC 100, 120, 200, 240V	0°C ~ 40°C AC 100, 120, 200, 240V
Size and Weight	150(W) x 200(H) x 250(D)mm 3.5kg approx.	150(W) x 175(H) x 250(D)mm 3kg approx.
Accessories	Connection Cable 2	BNC~Adaptor ..... 2 Connection Cable 2

Audio

FREQ. RESPONSE CHECKER

LAT-4012



Stereo Measurement Mixed 3-Frequencies

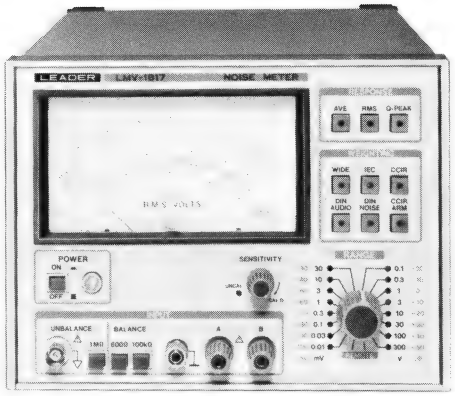
- The comparison and determination sections can be conveniently used for 2-channel stereo measurement.
- Each channel has dual-needle meter to indicate both the high band and low band characteristics at the same time.
- NO-GO-NO determination is indicated by lamps which are easy to see.
- Upper limit and lower limit for GO/NO judgement can be established by preset controls.

■ SPECIFICATIONS

Oscillator Frequency	Reference: 1kHz Lower band: 30, 60, 80, 100, 125, 150 250 and 400Hz (Selectable on the front panel)
	Upper band: 4, 6, 7, 8, 9, 10, 12, 12.5 13, 14, 15 and 16kHz (Selectable on the front panel)
Distortion Factor Output Level Output Deviation	Less than 0.8% –120 ~ 0dBV (1dB step) 0dB=1Vrms Within ±0.5dB (1kHz reference)
Attenuator Accuracy Output Impedance	Within ± 3% 50Ω Unbalanced
Voltage comparator & Judgement Section Input Resistance Input Voltage Range	(Common to 2 channels) Approx. 500kΩ –30 ~ –10dBV (1kHz)
Voltage comparator Indication	Low band/high band simultaneous indication by dual-needle meter
Measurement Range Accuracy	±15dB Within ±1dB
Judgement Section Judgement Method	LOW-GO-HIGH lamp indication by presetting the upper limt and lower limit values for the low band and high band.
Setting Method of Upper and Lower Limit Values	After setting value on the meter by switch selection, set the value by the semi fixed volume on the front panel.
Power Supply Size and Weight	AC100, 120, 220, 240V, 50/60Hz approx. 30VA 400(W) x 200(H) x 400(D)mm, 12kg

NOISE METER

LMV-1817



dB Linear Scale

- High sensitivity of 10μV (–100dB) full scale.
- For the response characteristics of the meter, selection can be made of average value response, effective value response and quasi-peak value response.
- It has 5 built-in filters of different types in order to conform to the various standards.
- It is provided with balanced and unbalanced inputs.

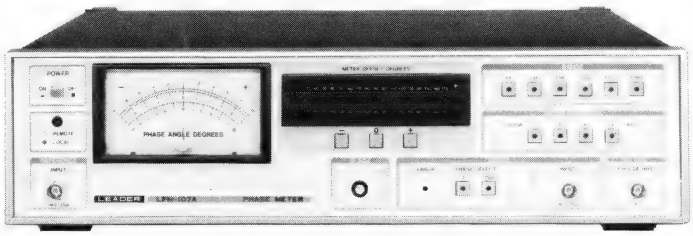
■ SPECIFICATIONS

Measuring Range AVE/RMS Q-PEAK	 –100dB (10μV)~+50dB (300V) 16 ranges –90dB (30μV)~+50dB (300V) 15 ranges
Accuracy AVE/RMS	(without weighting, at 1 kHz) –100dB range: ±1dB –90dB~+50dB range: ±0.3dB
Q-PEAK	–90dB range: ±1dB –80dB~+50dB range: ±0.5dB
Frequency Characteristics 600Ω/100kΩ Input –100dB~+50dB range	(without weighting, 1kH standard) AVE/RMS 10Hz~50kHz within ±1dB Q-PEAK 20Hz~50kHz within ±1dB
1MΩ Input –100dB~–80dB range –70dB~+50dB range	 AVE/RMS: 10Hz~50kHz within ±1dB AVE: 10Hz~500kHz within ±1dB RMS: 10Hz~200kHz within ±1dB Q-PEAK: 20Hz~50kHz within ±1dB
Response Characteristics	AVE: Average value response RMS: Effective value response Q-PEAK: Quasi peak value response Scale calibrated through sine wave effective value
Weighting Characteristics IEC CCIR CCIR/ARM DIN AUDIO DIN NOISE	 Filter based on IEC 179 (A Curve) Filter based on CCIR standards Filter based on CCIR/ARM Filter for measuring audio signals based on DIN45405 Filter for measuring noise levels based on DIN 45405
Sensitivity Controller	0~approx. –12dB Continuously variable
Input Impedance	600Ω Balanced Input: 600Ω ±10% 100kΩ Balanced Input: 100kΩ ±10% 1MΩ Unbalanced Input: 1MΩ ±10% less than 55pF
Remote Control Function	Range, Response, Weighting. Negative logic, TTL Level
Power Supply	AC 100, 120, 220, 240V 50/60 Hz 11VA
Size and Weight Accessory	200(W)x150(H)x300(D)mm, 3.5kg BNC~Clip cable 1

Audio

PHASE METER

LPM-107A



NEW

Full Scale ±5° Range 5mV ~ 30V

The LPM-107A is a high-sensitivity phase meter for measuring phase angle and phase characteristics over a wide band in various engineering fields including electrical equipment.

- The meter offset function makes it possible to use the full scale ±5° range regardless of whether the phase difference is large or small.
- With remote control function.
- Measuring phases of transmission and servo system at production lines & laboratories.

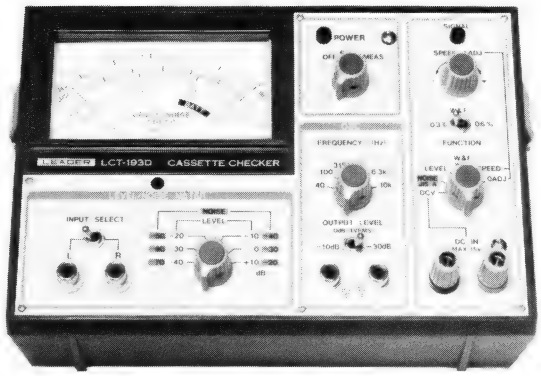
■ SPECIFICATIONS

Measurement Freq. Range	10Hz~2MHz
Phase Angle Measurement Range	0 ~ ±180° in the following 6 ranges 0 ~ ±5° 0 ~ ±10°, 0 ~ ±18° 0 ~ ±50°, 0 ~ ±100°, 0 ~ ±180°
Measured Input Voltage Range	5mV ~ 30V, automatic internal switching between 2 ranges.
Input Impedance Meter Offset Meter Offset Error	1MΩ, parallel capacitance 25pF maximum ±170° in 10° steps ±0.5% of the offset phase angle
Measuring Accuracy	each range ± ≪(2.5% + 0.1°) + offset error≫ of indicated maximum value. This relation holds when the identical voltage is input for REFERENCE and SIGNAL.
Phase Output Signal (DC)	DC voltage corresponding to measured phase angle, 10mV/degrees
Phase Output Signal Error	±(0.5% + 0.1°), but becomes ±1° when the level difference between REFERENCE and SIGNAL is 20dB.
Error Due to Input Level	±1° when the level difference between REFERENCE and SIGNAL is 20dB.
Phase Output Signal Rise Time	about 30ms/180°
Remote Control Function	All panel operations except for meter zero adjustment Remote control level 5V CMOS level negative logic Remote control system according to BCD code Meter offset: 5 bits + sign bit (1 bit) Range: 3 bits Meter response: 2 bits Phase select: 1 bit
Power Supply	AC100, 120, 220, 240V, 50/60Hz, about 20VA
Size and Weight	400(W) x 100(H) x 300(D)mm

CASSETTE CHECKER

LCT-193D

FOR SERVICE



Portable Cassette Checker Six Items Can Be Measured

The LCT-193D is a portable cassette checker with six kinds of measuring functions to check characteristically audio cassette players. Designed small and lightweight, the LCT-193D is an easy-to-handle instrument, optimum for use in servicing cassette players.

Functions: tape speed measurement, wow & flutter measurement, level measurement, noise level measurement, low frequency oscillator, DC voltage measurement

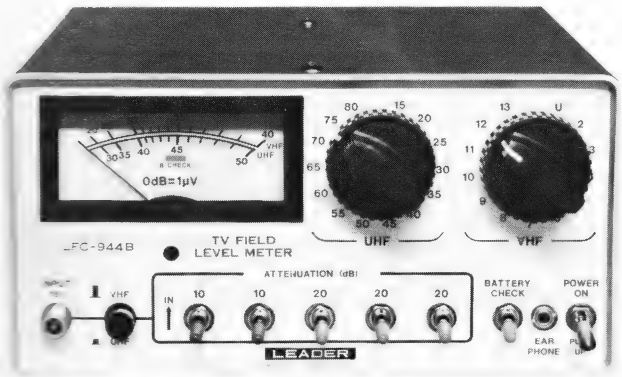
■ SPECIFICATIONS

Tape Speed Measurement	
Measuring Frequency	3.15kHz
Measuring Range	±3%
Measuring Accuracy	±10% of F.S
Wow & Flutter Measurement	
Measuring Frequency	3.15kHz ±8%
Measuring Range	0.3, 0.6% F.S, 2 ranges
Measuring Accuracy	±10% of F.S
Measuring Method	Permit DIN WTD PEAK format
Level Measurement	
Measuring Range	−60dBV to +12dBV, 6 ranges
Measuring Accuracy	±10% of scale length at 2kHz
Frequency Characteristics	20Hz to 20kHz ±0.8dB (2kHz as standard)
Noise Measurement	
Measuring Range	−90dBV to −18dBV, 6 ranges
Audio Correction Curve	IEC-A
Measuring Accuracy	±10% of scale length
Measuring Method	Mean value detection, effective value indication
Oscillator	
Oscillation Frequency	40Hz, 100Hz, 315Hz, 1kHz, 6.3kHz and 10kHz
Frequency Accuracy	±5% ±2Hz
Output Level	−10, −30dBV, ±1dBV (with 10kΩ load at 1kHz)
Output Deviation	Within ±0.8dB (1kHz as standard)
Distortion Rate	Less than 0.5%
DC Voltage Measurement	
Measuring Range/Accuracy	15V F.S, 1 range/±5% of F.S
Power Supply	006P (9V) x 2
Battery Life	Approx. 30 hours for continuous use (manganese battery is used) With connection terminal for AC adaptor
Size and Weight	210(W) x 140(H) x 75(D)mm, 1.1kg
Accessories	Pin plug to mini plug . . . . . 1 Pin plug to pin plug . . . . . 1 Test leads . . . . . 1 Battery 006P (9V) 2

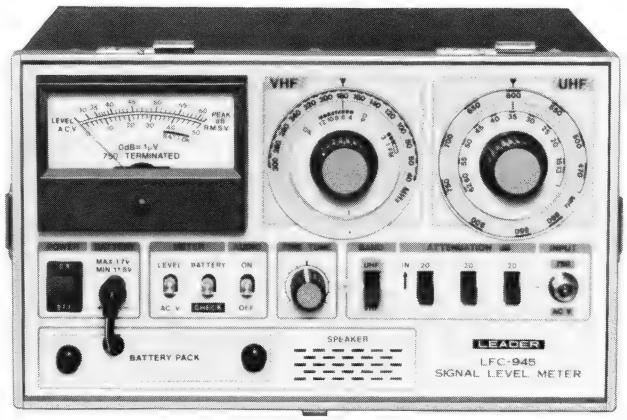
Field Level Checker

TV-VHF/UHF FIELD LEVEL METERS

LFC-944B, 944C, 944D
(USA) (EUROPE) (CHINA)



LFC-945



VHF : 20~120dB
UHF : 30~100dB

Good picture reception is unavailable without a certain level of signal reception though a television receiver works perfect. Therefore, the signal reception condition such as an antenna height, direction, and its performance must be thoroughly examined. TV Field Level Checker is used for this purpose. It is usual that 65dB gain or more is necessary for good color reception. VHF and UHF can be measured in the same operation with that of TV.

TV-VHF/UHF, FM, CATV

- Continuously covers VHF band, 40 to 300MHz, and UHF band, 470 to 890MHz. In addition to VHF/UHF TV signals, a wide range of level measurement is available for CATV and FM signals.
- When 50/60Hz AC signal is superposed with input RF signal on CATV distribution system, RF signal and AC signal can be separately measured.
- Built-in loudspeaker enables monitoring of buzz sound.

■ SPECIFICATIONS

TV Channels USA ch (944B)	(at picture frequency) VHF Channels: 2~13 UHF Channels: 14~83
European ch (944C)	VHF Channels: 2~12 UHF Channels: 21~69
China (944D)	VHF Channels: 1~12 UHF Channels: 13~57
Input Signal Level Level Accuracy	VHF: 20~120dB (10μV~1V) UHF: 30~100dB (30μV~0.1V) VHF: ±3dB, UHF: ±4dB
Level Indication Meter Scale	dB calibration, referred to input from 75Ω, at open circuit.
Attenuator	80dB total in 20dB x 3 and 10dB x 2
Amplifier Bandwidth	Approx. 500kHz at 3dB down
Power Supply	13.5V, using 9 each Type UM2, Type C, Burgess 1, NEDA 14, or equivalent
Size and Weight Accessories	200(W) x 100(H) x 200(D)mm, 2.6kg Matching pad (Balun) LBN-14 (300Ω/75Ω) . . . 1 Earphone . . . 1, Carrying case . . . 1

■ SPECIFICATIONS

Receiving frequency band Measurement level range	VHF: 40 to 300MHz UHF: 470 to 890MHz 30 to 120dBμ (−30 to +60dBmV)
Detection system and indication value	Peak level detection: 75Ω termination voltage
Measurement accuracy for (at 20°C)	VHF: ±1.5dB or Less UHF: ±2.0dB or Less
Measurement accuracy temperature characteristics Input impedance connector	± 1.5dB or less (0° to 40°C) 75Ω F-J
Input VSWR	VHF: Within 1.5 (ATT. OFF) Within 1.3 (ATT. ON) UHF: Within 1.8 (ATT. OFF) Within 1.5 (ATT. ON)
Attenuator Attenuator accuracy	20dB x 3 VHF: ±0.5dB or less UHF: ±1.5dB or less
Intermediate frequency Bandwidth Adjacent channel interference ratio	45.75MHz Approx. 500kHz (−3dB) 30dB or more
Image suppression ratio Direct wave jump-in interference ratio	35dB or more VHF: 70dB or more UHF: 60dB or more
Output meter scale	Indication range: 32dB (30 to 62dB) 1dB scale between 27dB (35 to 62dB)
Voltage measurement Voltmeter accuracy Audio monitor	AC50V, 50/60Hz F-type connector ±5% of full scale Loudspeaker with on/off switch, slope detection
Power source Size and Weight	DC15V, UM-3 dry cell x 10 250(W) x 148(H) x 235(D)mm, 4kg
Accessories	UM-3 dry cell . . . . . 10 Shoulder band . . . . . 1 Balun: 300Ω−75Ω (LBN-14) . . . . 1 Hexagonal wrench . . . . . 1 Channel plate 6

Pattern Generator

NTSC PATTERN GENERATOR

LCG-396(RGB)

11 Test Patterns

Selectable Interlaced or Progressive Scanning

The LCG-396 is a versatile NTSC video generator suitable for testing, servicing and evaluating a broad range of video systems including video tape recorders, CATV and MATV systems, video monitors and television receivers.

It provides 11 test patterns including the standard NTSC color bars for measuring and adjusting color purity, white balance, luminance, chrominance, and convergence.

Output includes composite video, H or V scope trigger, sub-carrier and RF (CH-3 or CH-4). Other features include variable chroma, luminance and set-up levels, and selectable interlaced or progressive scanning.

Also available as an option are RGB outputs on the rear panel for testing color computer display systems and video game color circuitry. A four rear panel output including composite sync is included in the RGB option.

The LCG-396 is supplied with a comprehensive user's manual including detailed VTR, TV and monitor application data.

■ FEATURES

- NTSC standard type color bars for VTR servicing.
- Red, blue, green and white rasters for purity and white balance tests.
- It is possible to produce 75Ω video output for video equipment and RF output for TV receivers.
- It is possible to produce scope trigger output.

■ SPECIFICATIONS (LCG-396, LCG-396 RGB)

System	NTSC-M
Patterns	
Color Bars	NTSC color bars in order of 75% amplitude.
Upper picture	From left: 75% amplitude, white, yellow, cyan, green, magenta, red, blue & black.
Lower picture	From left, Q, I 100% amplitude, black and white.
QIW OFF	Full-field color bars in which color bars of upper picture are inserted instead of Q, I 100% amplitude white of lower frame.
CHROMA OFF	Pattern with luminance only by removing chrominance from color bar signals.
LUMINANCE OFF	Pattern with chrominance only by removing luminance from color bar signals.
Crosshatch	21(V) x 16(H), white including one center dot.
Dots	20(V) x 15(H), centering around raster, white.
Rasters	Red, blue, green and white.
RF Output	USA, CH-3: 61.25 MHz CH-4: 67.25 MHz Output voltage: 10mV rms approx. (No load) Impedance: 75Ω Modulation: Negative
Video Output	Output voltage Fixed: approx. 1 Vp-p (on 75Ω load) Continuous variable: 0~1.5 Vp-p (on 75Ω load) Polarity: Positive (Sync signal is negative)
Scope Trigger Output	Frequency: Horizontal & Vertical frequency. Output voltage: 1 Vp-p approx. (No load) Output Impedance: 75Ω
Subcarrier Output	Frequency: 3.579545MHz ± 100Hz Output voltage: 1 Vp-p approx. (No load)
Synchronization	Both interlace and progressive scanning H: 15.734 kHz V: 59.94/60.05 Hz
Power Supply	AC 100, 120, 200, 220, 240V, 50/60 Hz, 18VA
Size and Weight Accessories	200(W) x 120(H) x 300(D) mm, 3.2 kg BNC~clip cable . . . . . (1) F~clip cable . . . . . (1)

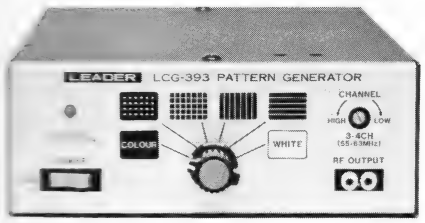
■ SPECIFICATIONS (LCG-396 RGB only)

Color Bar Signals	R, G and B outputs deliver color signals respectively.
Dot, Crosshatch, Single Cross	R, G and B outputs deliver the same signals.
R.G.B. Outputs	TTL output fan out 1 positive output.
Sync Output	TTL output fan out 1 negative output.

Pattern Generator

PAL PATTERN GENERATORS

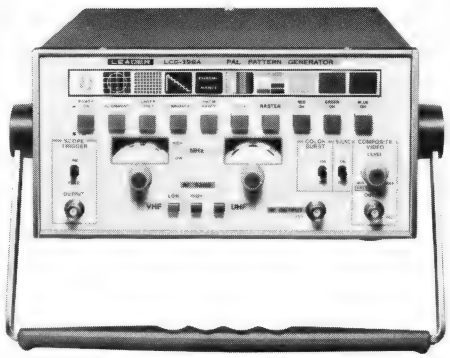
LCG-393



PAL-B
6 Patterns

- White raster pattern for purity and white balance tests.
- Four basic patterns dots, cross-hatch vertical lines and horizontal lines for tests and adjustments of convergence and raster alignments.

LCG-399A



PAL-B, C, D, G, H, I, K, & L
5 Patterns + 8 Color Rasters

- Raster in 8 colors for testing/adjusting purity, white balance, etc.
- Moving marker can be inserted into color bars for testing of multi-speed VTRs by use of the internal selectors.

LCG-403C, 403D

(EUROPE) (CHINA)

NEW

PAL-B, G, H, D & K
4 Patterns +8 Color Rasters

- Convergence pattern for testing/adjusting convergence.
- VHF/UHF RF output for TV receivers.
- Composite video output of 75 ohm impedance for video equipments.

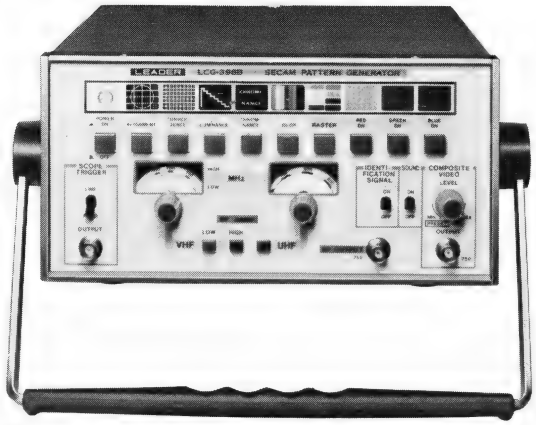
SPECIFICATIONS

MODEL	LCG-393	LCG-399A	LCG-403
System	PAL-B	PAL-B, C, D, G, H, I, K & L	PAL-B, G, H, D & K
Pattern: Color	Splitted into two portions Upper-half: Red, Bluish-green, Blue, Greenish-yellow, White Lower-half: Gray x 4, Black	75% amplitude, 100% saturated color bars. From left to right on the screen, 8 color bars of white, yellow, cyan, green, magenta, red, blue & black	
		Modified color bars: 100% white, reverse alternate color bars, rejection of chrominance, moving marker	———
Dot/ Crosshatch	19 x 15 (White dots) 19 x 15 (White lines)	——— ———	11 x 17 (White dots) 11 x 17 (White lines)
Convergence	———	Composite of crosshatch of 20V x 14H and dots of 19V x 15H. Includes picture center marker and safety zone marker. White lines and dots on black background.	———
Chrominance	———	Rejection of luminance component from color bar pattern.	———
Luminance	———	Rejection of chrominance component from color bar pattern.	
Raster	White	8 colors by the combination of red, green & blue. 100% white (75% white 399A only), yellow, cyan, green, magenta, red, blue & black.	
Alignment	———	Composite of 5V x 5H crosshatch, single or double circle (internally selectable) and polarity marker (bottom right of screen). White lines and dots on black background.	———
Synchronizing Signals	X'tal controlled progressive scanning H:15.611kHz, V:50.036Hz	Number of scanning lines: 625, Line frequency: 15.625kHz	
		Field frequency: 50Hz(interlaced scanning), 50.08Hz (progressive scanning)	Field frequency: 50Hz
Sub-carrier Frequency	4.43361875MHz ±50Hz	4.43361875MHz ±100Hz	4.433619MHz
RF Output	VHF: 55~63MHz Level: 10mV approx. into 300Ω load	VHF: Low 55~63MHz, High 185~205MHz, UHF: 471.25~885.25MHz Level: VHF: over 5mV into 75Ω load UHF: over 0.5mV into 75Ω load	403C: VHF CH-2 ~ CH-12 UHF CH-21 ~ CH-69 403D: VHF CH-1 ~ CH-12 UHF CH-13 ~ CH-57
Composite Video Output	———	Continuously variable 0 to approx. 1Vp-p into 75Ω load	Approx. 1Vp-p into 75Ω load
Sound Signal	———	Intercarrier system frequency: 5.5, 6 and 6.5 MHz, Modulation: AM/FM 1kHz sine wave	Intercarrier system frequency: 5.5MHz, (403C), 6.5MHz (403D), Modulation: FM
Scope Trigger Output	———	Frequency: Line and field Output Voltage: Approx. 3Vp-p on no load	
Power Supply	AC100, 120, 220, 240V, 50/60Hz, approx. 10VA	AC100, 120, 220, 240V, 50/60Hz, Max. 25VA	UM-2x4 or AC adaptor (option)
Dimensions/Weight	150(W)x55(H)x200(D)mm, 1.2kg	250(W)x125(H)x325(D)mm, approx. 4.3kg	210(W)x80(H)x265(D)mm, approx. 3kg
Accessory	RF output cable 1	BNC~clip cable 1	Antenna cord (PAL-P~PAL-P) . . . 1 UM-2 4

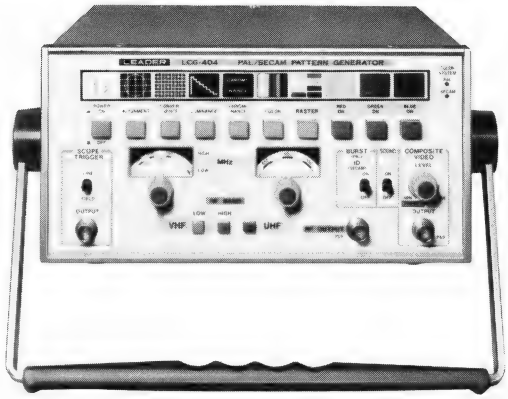
Pattern Generator

PAL/SECAM PATTERN GENERATORS

LCG-398B



LCG-404



SECAM-Ⅲ 5 Patterns + 8 Color Rasters	PAL/SECAM-Ⅲ 6 Patterns + 8 Color Rasters

■ FEATURES

- Raster in 8 colors for testing/adjusting purity, white balance, etc.
- Convergence pattern for testing/adjusting convergence.
- Alignment pattern (circle) for testing/adjusting linearity, centering, deflection yoke polarity, etc.
- Composite video output of 75 ohm impedance for video equipments.
- VHF/UHF RF output for TV receivers.
- RF modulation polarity can be changed over positive/negative to conform with each system.
- Scope trigger output for externally triggering of oscilloscope.
- Sound signal is available, and SIF frequency can be generated at 5.5, 6 or 6.5MHz. AM and FM in 1kHz modulation are available.
- Moving marker can be inserted into color bars for testing of multi speed VTRs. (PAL system of LCG-404)

(This feature is made by internal selector and available only for PAL system.)

■ SECAM System LCG-398B, 404

Color System Sub-carrier Freq. Identification Signals	SECAM Ⅲ-B, C, D, G, H, I, K, L f_{OR} = 4.40625MHz f_{OB} = 4.25MHz D_R 4.75625MHz D_B 3.900MHz

■ PAL System LCG-404

Color System Modified Color Bars	PAL-B, C, D, G, H, I, K, L Following can be added by internal selector to color bars of PAL system only. 1 100% white 2 Reverse alternate color bars 3 Rejection of chrominance 4 Moving marker
Sub-carrier Frequency	4.43361875MHz ±100Hz

■ SPECIFICATIONS LCG-398B/404

Patterns Color Bars	75% amplitude, 100% saturation color bars. From left to right on the screen, 8 color bars of white, yellow, cyan, green, magenta, red, blue and black. Full field color bar.
Chrominance	Rejection of luminance component from color bar pattern.
Luminance	Rejection of chrominance component from color bar pattern.
Raster	8 colors by the combination of red, green and blue. 100% white, yellow, cyan, green, magenta, red, blue and black.
Convergence	Composite of crosshatch of 20V x 14H and dots of 19V x 15H. Includes picture center marker and safety zone marker. White lines and dots on black background.
Alignment	Composite of 5V x 5H crosshatch, single or double circle and polarity marker.
Composite Video Output Output Voltage	Continuously variable 0 to approx. 1Vp-p into 75Ω load.
Output Impedance Polarity	75Ω Positive polarity (synchronization negative)
RF Output Picture Carrier Frequency	(VHF) Low 55~63MHz, High 185~205MHz (UHF) 471.25~885.25MHz
Output Voltage	(VHF) More than 5mV into 75Ω load (UHF) More than 0.5mV into 75Ω load
Output Impedance Modulation Polarity	Approx. 75Ω Possible to change-over positive/negative
Scope Trigger Output Frequency Output Voltage Output Impedance	Line and field Approx. 3Vp-p on no load Approx. 10kΩ
Synchronizing Signals Number of Scanning Lines	625
Line Frequency	15.625kHz
Field Frequency	50Hz : Interlaced scanning (luminance, chrominance, color bar and raster patterns) 50.08Hz: Progressive scanning (alignment and convergence patterns)
Sound Signal System	Intercarrier system
Sound Intercarrier Frequency	5.5, 6 and 6.5MHz
Modulation Signal Modulation	1kHz sine wave AM and FM
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 20VA (LCG-398B), 25VA (LCG-404)
Size and Weight Accessory	250(W)x125(H)x325(D)mm, approx. 4.3kg BNC ~ Clip cable 1

Pattern Generator

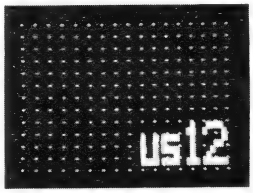
NTSC, PAL PATTERN GENERATORS

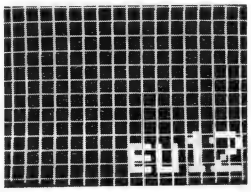
LCG-405

LCG-405P

Pattern can be observed in all VHF channels

■ Not only Pattern but also Channel Name are Displayed.





The LCG-405 (NTSC) and LCG-405P (PAL) are pattern generators with two main functions: the pattern signal generation to tune or repair television receivers (for black-and-white/color TVs), the video carrier generation for all VHF channels (LCG-405: ch 2 ~ ch 13 in the U.S.A., LCG-405P: ch-1 ~ch-12 in Europe) to tune and test television receivers, channels of which are preset by the ET tuner. In addition, the pattern signal generated is superimposed by a channel number of the video carrier, so that the preset ET tuner condition can be easily checked.

Although the LCG-405 uses offset subcarrier type color bars, it can also apply external modulation signals of NTSC standard color bars (generated by LCG-405; LCG-400, LCG-401 etc. LCG-405P: LCG-398B, LCG-399A) based on the broadcasting standards. Its video carrier generator has adopted a PLL synthesizer device to provide a highly accurate and stable carrier. All of these functions enable effective tuning and checking of television receivers with the ET tuner.

■ FEATURES

- Video carrier for any of the VHF channels (LCG-405: ch 2 ~ ch 13 in the U.S.A., LCG-405P: ch 1 ~ ch 12 in Europe) can be arbitrarily selected by push-switch operation.
- PLL synthesizer-type carrier generator provides accurate and stable carrier waves.
- Channel number is superimposed on each pattern signal to simplify channel checking.
- By using its external modulation terminal, the LCG-405 can be connected to other pattern generators to modulate pattern signals.

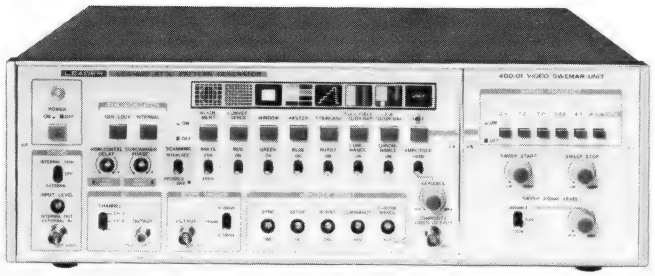
■ SPECIFICATIONS

MODEL	LCG-405	LCG-405P
RF Output Accuracy Output Impedance Output Voltage	USA 2 ~ 13 ch ±0.01% 75Ω 5mVrms (75Ω load) or more	Europe 1 ~ 12 ch ±0.01% 75Ω 5mVrms (75Ω load) or more
Synchronization Horizontal Vertical Blanking	 15.75kHz 60.11Hz (non-interlaced scanning) Horizontal and Vertical	 15.611kHz 50.036Hz Horizontal and Vertical
Pattern Color Bars	10 bars (offset) with a phase difference of 30° Offset sub-carrier frequency: 3.563795 MHz ± 200Hz	 Sub-carrier frequency: 4.43361875MHz ± 50 Hz
Dots Vertical Lines Horizontal Lines White Raster	White dots: 21 (vertical) x15 (horizontal) 21 white lines 15 white lines White raster without noise	White dots: 19 (vertical) x 15 (horizontal) 19 white lines 15 white lines White raster without noise
Channel Display	Display of channel number corresponding to the channel of video carrier and "US" meaning USA channel are superimposed, in about 75% white level, at the lower right end of each pattern.	Display of channel number corresponding to the channel of video carrier and "EU" meaning Europe channel are superimposed, in about 75% white level, at the lower right end of each pattern.
External Composite Video Signal Input Polarity Input Voltage Input Impedance	 (VIDEO) positive, (SYNC) negative Fixed at 1Vp-p (75Ω load) 75Ω	
Power Supply Size and Weight	AC100, 120, 220, 240V 50/60Hz 20VA 250(W) x 123(H) x 325 (D)mm, 4.3kg approx.	
Accessory	BNC ~ clip cable ... 1	

Pattern Generator

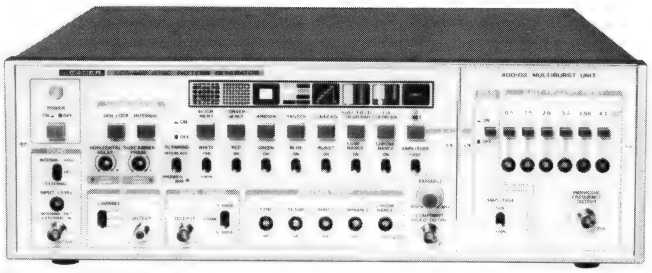
NTSC PATTERN GENERATORS

LCG-400-01



Video Sweep ; 50kHz ~ 7MHz

LCG-400-02



Multiburst ; 0.5~4.2MHz 6 points

A Broad Range of Video Capabilities for Studio and Service Applications

- Provides Gen-Lock capabilities and a broad range of video test signals.
- Provides accurate test signals for evaluating and adjusting monitors, cameras, VTRs and overall system performance.
- Available in either bench top or rack mount configurations.
- Video sweep and multiburst functions of easy-looking of frequency characteristics of video equipments.

■ SPECIFICATIONS (Common to both the LCG-400-01, 400-02)

Color System	NTSC-M
Patterns	
EIA Color Bar	EIA Standard RS-189A (Equivalent) 75% Amplitude 100% Saturated Color Bar. Gray (75% white), Yellow Cyan, Green, Magenta, Red, –I, 100% White, Q and Black.
Full Field Color Bar	75% Amplitude, 100% Saturated Color Bar. Gray (75% white), Yellow, Cyan, Green, Magenta, Red, Blue, Black.
Staircase	5 step
Raster	8 colors: Red, Green and Blue (combined) White (100% and 75%), Yellow, Cyan, Green, Magenta, Red, Blue and Black.
Window	White window on black background
Convergence	Cross Hatch 17x13, Dot 16x12 and center
Alignment	Cross Hatch 9x7, Circle, Corner Marker
SYNC Signal	EIA Standard RS-170A (Equivalent)
Number of Scanning Line	Interlace 525, Progressive 262
Line Frequency	15.734kHz
Field Frequency	Interlace 59.94Hz, Progressive 60.05Hz
Scanning System	Interlace, Progressive
GEN-LOCK	Synchronized Video Signal Input
Horizontal Delay	±4μs continuously variable
Sub-Carrier Phase	0°~360° continuously variable
Output Signal (Front Panel)	
Composite Video Output	Voltage: 1V fixed, 0~1V variable into 75Ω load, Polarity: Negative Sync
Scope Trigger Output	Mode: HD, VD, Frame, Impedance (75Ω) Voltage: 4V into 75Ω
RF Output (Impedance 75Ω)	CH-3 61.25MHz ± 0.5% CH-4 67.25MHz ± 0.5% Voltage: Video more than 10mVrms Audio more than 1mVrms
Sound	Intercarrier System F_3 (FM)
Carrier Frequency	4.5MHz
Internal Modulation	1kHz Sine Wave
EXT. Mod. Frequency	50Hz ~ 10kHz
Input Voltage	3Vp-p
Input Impedance	600Ω
Internal Signal Output	Frequency 1kHz Voltage 3Vp-p approx. (open circuit)
Output Signal	(Rear Panel)
Composite Video Output	Voltage: 1V fixed into 75Ω Polarity: Negative Sync.
Black Burst Output	Polarity: Negative Sync. Setup: 0.054V Burst: 0.286V Synchronizing Signal: 0.286V into 75Ω load
Composite Sync	Polarity: Negative, Voltage: 4V into 75Ω load
Composite Blanking	Polarity: Negative, Voltage: 4V into 75Ω load
Subcarrier Output	Frequency: 3.579545MHz ± 5Hz (0°~40°C), Voltage: More than 2Vp-p into 75Ω load
Burst	Polarity: Negative, Voltage: 4V into 75Ω load
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 30VA
Size and Weight	426(W)x132(H)x400(D)mm, 8.2kg
Accessory	BNC~clip cable(1), F~clip cable(1)

■ SPECIFICATIONS (Only LCG-400-01)

Video Sweep

Sweep Frequency Range	50kHz ~ 7MHz
Sweep Rate	Synchronized with Field
Amplitude	50%, 100% fixed and 0~100% variable
Flatness	Within ± 1dB
Marker Frequency	0.5MHz, 1MHz, 2MHz, 3.58MHz, 4.5MHz ± 3%, Option

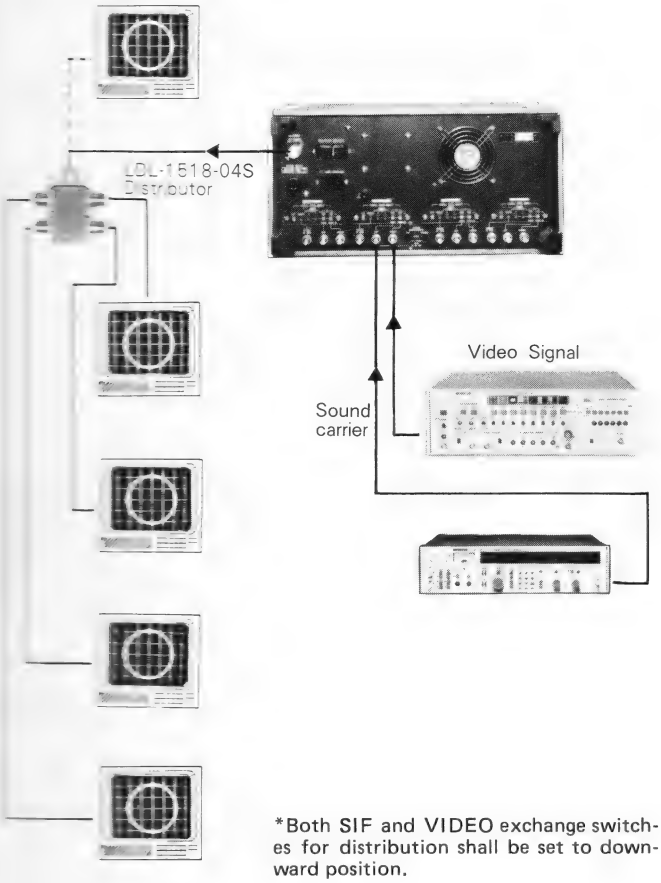
■ SPECIFICATIONS (Only LCG-400-02)

Multiburst

Frequency	0.5MHz, 1.5MHz, 2MHz, 3MHz, 3.58MHz, 4.2MHz ± 3%, 6 Points
Reference Level	100% White at left end of burst
Period	Synchronized line scan
Amplitude	50% and 100%
Flatness	Within ± 1dB

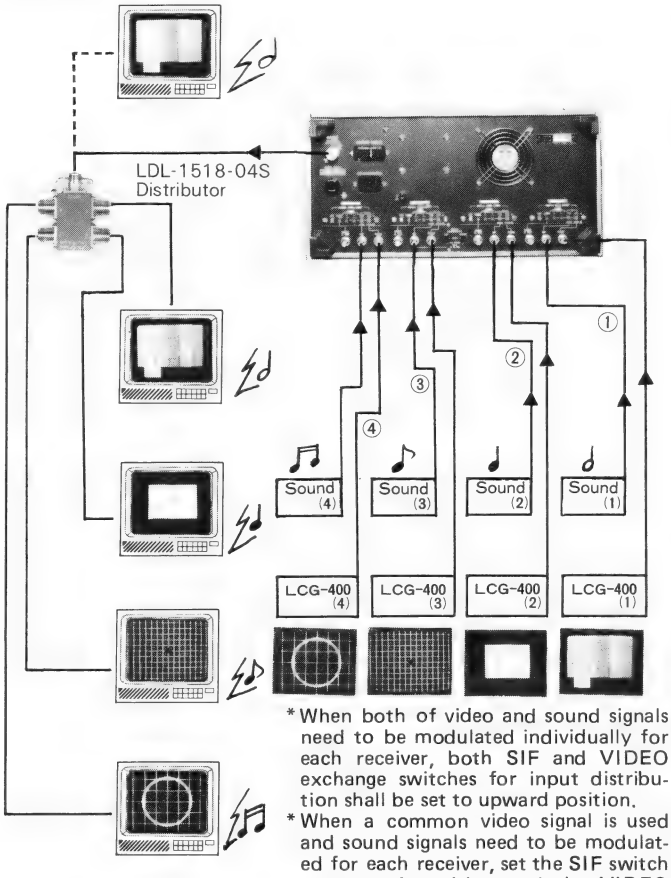
Signal Generator

★ Check television receiver by modulating video/sound signals commonly applied to the receiver under test



*Both SIF and VIDEO exchange switches for distribution shall be set to downward position.

★ Check television receivers simultaneously by modulating video/sound signals individually for each receiver



*When both of video and sound signals need to be modulated individually for each receiver, both SIF and VIDEO exchange switches for input distribution shall be set to upward position.
*When a common video signal is used and sound signals need to be modulated for each receiver, set the SIF switch to upward position and the VIDEO switch to downward position.

Diagram of rack system

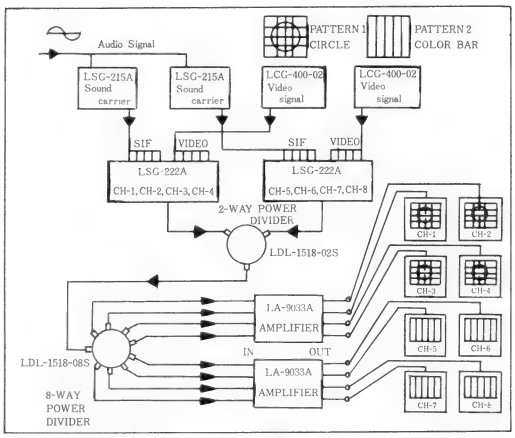
★ CENTRALIZED TV SIGNAL GENERATOR SYSTEM

LA-9033A
AMPLIFIER
[4 INPUT/4 OUTPUT
TOTAL 8-INPUT/OUTPUT]

LSG-222A
SIGNAL GENERATOR
[4CHANNEL×2
TOTAL : 8CH]

LSG-215A
FM-AM STANDARD SIGNAL GENERATOR

LCG-400-02
PATTERN GENERATOR



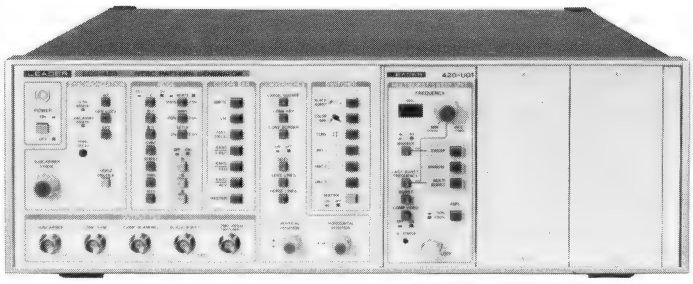
The LA-9033A is a wide-band amplifier designed to compensate for insufficient television high frequency output related to multiple distribution when using the LSG-221A or LSG-222A. From VHF to UHF bands, the LA-9033A features a high gain exceeding 20dB, and low NF (noise figure), favorable cross modulation, intermodulation, and ham modulation characteristics. This instrument is provided with four built-in amplifiers, so that you can implement a large-scale integrated television signal pattern system.

Bandwidth	45~110MHz, 170~225MHz, 470~825MHz
Gain	45~110MHz: 20~23dB, 170~225MHz 25~28dB, 470~825MHz: 30~35dB
Input/Output Impedance	75Ω
Max. Output Level	VHF: 95dBμ UHF: 100dBμ
Size and Weight	400(W)x148(H)x400(D)mm, 15kg

Pattern Generator

NTSC-M PATTERN GENERATOR

LCG-420



NEW

High-Accuracy Test Signal

The LCG-420 is a standard test signal generator suitable for use in adjustment, testing and R&D of NTSC video system broadcast equipment. The LCG-420 NTSC test pattern generator provides high-accuracy test signals and features a full compliment of unique functions and sync signal outputs.
It consists of the mainframe and plug-in units (optional) and is designed to be easily rack mounted by means of optional rack adaptors, greatly facilitating the implementation of a rack-mounted video system.
The mainframe consists of a sync pulse generator, color bar generator and signal generator which generates a convergence signal, in addition to a video switcher which selects the various test signals.
Up to three plug-units sold separately may be housed in the mainframe, enabling output which mainframe does not provide, thus facilitating customization of test signal generating capabilities to suit individual application requirements. The 420-U01 Sweep/Multiburst unit, 420-U02 Pulse & Bar unit and 420-U03 Linearity unit are currently planned for introduction as standard plug-ins.

■ SPECIFICATIONS

Output Signal

Test Signal	BLACK BURST, COLOR BAR, SWITCHER or CONVERGENCE, OPTION (UNIT 1, UNIT 2, UNIT 3)
Synchronization Signal	SUBCARRIER, COMP. SYNC, COMP. BLANKING, H DRIVE, V DRIVE, BURST FLAG, FIELD REFERENCE

• Color System: NTSC-M • Subcarrier Frequency: 3.579545MHz ±5Hz (±1Hz: option) • Number of Scanning Line: Interlace 525
• Line Frequency: 15.73426kHz • Field Frequency: 59.94Hz
• Sync Signal Quality: EIA Standard RS-170A (Equivalent)

Input Signal

GEN LOCK INPUT (LOOP THROUGH), COMP. SYNC INPUT (LOOP THROUGH), SUBCARRIER INPUT (LOOP THROUGH)

GEN LOCK

Sync signal quality: Synchronized by input of the designated NTSC composite video signal or black burst signal
Horizontal Delay: over ±1μs continuous adjuster
Subcarrier Phase: 0° ~ 360° continuous adjuster

Color Bar Generator

Color Bar Pattern	SMPTE color bar, EIA color bar, FULL FIELD color bar, color bar/Y REF, color bar/RED, color bar/REVERSE, 8 raster (R.G.B. switch ON/OFF)
Mode Control	WHITE 100%, 75%, AMPLITUDE 100%, 75%, SETUP 0%, 7.5%, SYNC ON/OFF, BURST ON/OFF, VIRS ON/OFF, VITS ON/OFF, Y ON/OFF, R-Y ON/OFF, B-Y ON/OFF, R raster ON/OFF, G raster ON/OFF, B raster ON/OFF
Composite Video Output	Up to three parallel outputs are possible. All outputs are 1Vp-p into a 75Ω termination.

Convergence Generator

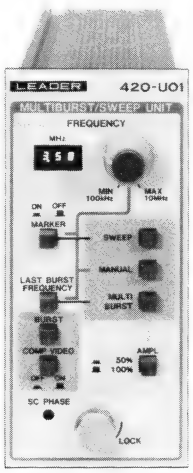
Pattern	Vertical line, Horizontal line, Dots
Selection of Size	Pattern interval cross-hatching of large or small square (see pattern description) using LARGE SQUARE switch.
Positioning	Vertical and horizontal positions adjustments
Keying	The convergence signal may be keyed to the video signal selected by the switcher using the CONV. KEY switch.
Border	A convergence pattern may be displayed in the border around and center of the video signal selected by the switcher, using CONV. BORDER switch.
Composite Video Output	By selecting the switcher convergence output, the rear or front panel switcher output may be used as well for a total of two convergence signal outputs.

Switcher

Selection	Black burst, Color bar, Convergence, Unit 1~3
Matrix	An internal ROM program provides a vertically divided display of the above described signal as selected.
Composite Video Output	Dedicated switcher output signals on the front and rear panels are provided for two outputs usable in parallel (1Vp-p/75Ω termination).

Power Supply	AC100, 120, 220, 240V 50/60Hz 115VA
Size and Weight	426(W) x 132(H) x 450(D)mm, 15kg

420-U01 MULTIBURST/SWEEP PLUG-IN UNIT



The 420-U01 is a multiburst/sweep unit that plugs into the LCG-420.
A six-point multiburst signal from 0.5MHz to 4.2MHz (10MHz when the last burst is on) and a manual setting from 0.1MHz to 10MHz or video sweep enable all frequency characteristics to be measured easily.

■ SPECIFICATIONS

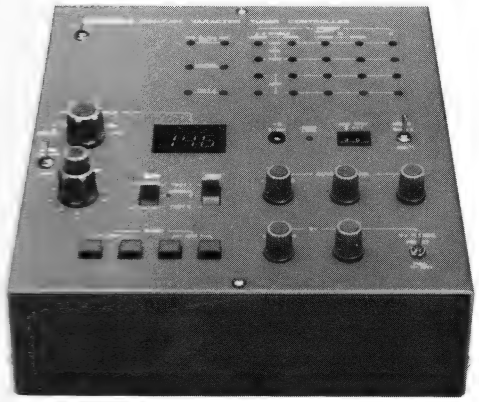
System	NTSC-M
Pattern	Multiburst, sweep, and manual
Multiburst	The LAST BURST FREQUENCY switch enables the 4.2MHz burst to be varied continuously from 4MHz to 10MHz.
Frequency	6 Points: 0.5MHz, 1.25MHz, 2MHz, 3MHz, 3.58MHz, 4.2MHz
Reference Level	100% White at left end of burst
Amplitude	50% and 100%
Flatness	±2 IRE (±14.28mV)
Sweep	
Frequency	0.1MHz ~ 10MHz
Amplitude	50% and 100%
Flatness	±2 IRE (±14.28mV)
Marker	The marker function can be switched on/off

Fixed Marker	0.5MHz, 1MHz, 2MHz, 3.58MHz, 5MHz, 6MHz
Variable Marker	0.1MHz~10MHz
Manual	
Frequency	0.1MHz~10MHz
Amplitude	50% and 100%
Flatness	±2 IRE (±14.28mV)
COMP VIDEO	When COMP VIDEO is off, SYNC. BURST, and SETUP are also swiched off so that only the picture signal is output.
Output Terminal	There are two composite video outputs: one for main unit input (75Ω, 1Vp-p) and one for switch input. (75Ω, 1Vp-p).
Size and Weight	58(W)x125(H)x340(D)mm, 1.5kg

Sweep Generator

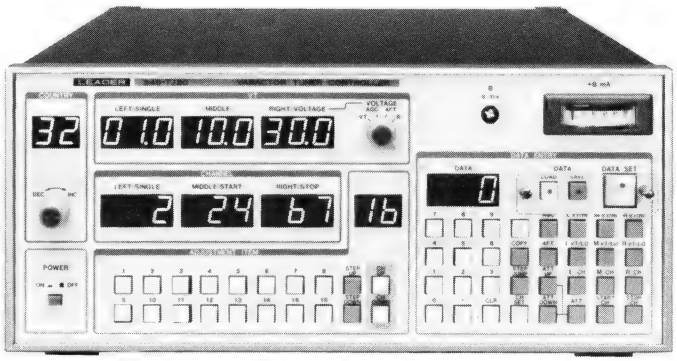
VARACTOR TUNER CONTROLLERS

344-TJ01



NEW

345-TJ20



NEW

Controller to Adjust VHF and UHF Electronic Tuners

The 344-TJ01 is a controller used with the LSW-344 TV VHF/UHF SWEMAR GENERATOR to adjust VHF and UHF electronic tuners.
It contains a built-in power supply for the electronic tuner, in which the voltage required for each test can be preset.

■ SPECIFICATIONS

LSW-344 Remote Control Functions	
MODE BAND	SINGLE/MULTI VHF LOW / VHF HIGH / UHF 1 / UHF 2
ATTENUATION	dB (A ATT) 0 ~ 63dB, 1dB step programmed
OUTPUT LEVEL	The settings for VHF and UHF are the same. L & SINGLE, M and R are variable. Range: more than 20dB.
Tuning Voltage of Electronic Tuner	
Three-mode tuning voltage switching circuit is built-in.	
Range PRESET FULL	Set of upper and lower limit voltage L & SINGLE, M 0 ~ 30V
Control of Tuning Voltage Variable Range	L & SINGLE, M: variable, R: adjustable 0 ~ 30V
Power Supply Voltage Setting for Electronic Tuner	
Power Supply +B	VL, VH, UB and MB supply voltages are set simultaneously. Range: 5 ~ 20V Adjustable Current limiting circuit is built-in, with an over-current indicator lamp that lights when current is 100mA or greater.
AGC Power Supply	NORMAL, TEST 1, TEST 2 Adjustable Range: 0 ~ 15V
AFT Power Supply	NORMAL, TEST 1, TEST 2 Adjustable Range: 0 ~ 15V
Digital Display of Supply Voltage and Check Function	Supply is switch — selectable. •VT L & SINGLE, VT M, VT R, +B, AGC, AFT •Accuracy ±1% rdg ±2dgt •Display with one decimal place
B ATT Switchable only during an AGC test	0 ~ 63dB, 1dB step programmed The attenuation during AGC test is a subtraction of (B ATT) from (A ATT) (B ATT) ≦ (A ATT)
Power Supply Overload Weight Accessories	AC100, 120, 220, 240V 50/60Hz, 17VA 230(W) x 70(H) x 260(D) mm, 3kg 50 pin amphenol cable . . . . . 1 DIN connector 8 pin . . . . . 1 Time lag fuse 1

The 345-TJ20 is a controller used with the LSW-345A TV VHF/UHF SWEMAR GENERATOR to adjust VHF and UHF electronic tuners.
It contains a built-in power supply for the electronic tuner, in which the voltage required for each test can be programmed.

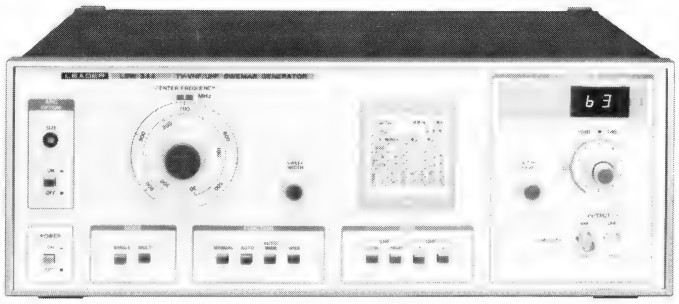
■ SPECIFICATIONS

LSW-345A Remote Control Functions	
BAND ATTENUATOR IF Freq. Selection RF Marker	VHF, UHF 0~63dB 1dB step, Programmable in 1dB steps Selection by 4 bit binary cord 32 countries, 200 channels each L, M and R programmable separately (only for channels in ROM)
Electronic Tuner Supply Voltage	
+B Power Supply (B_L, B_M, B_H, B_S, M_B, V_B, U_B) AGC, AFT Power Supply Tuning Voltage (VT)	9~15V adjustable 100mA Current-limiting circuit with 100mA ammeter is built-in. 0~15V 10mA max. Programmable with 0.1V resolution 0~30V, programmable with 100mV resolution. Lower and upper limit voltages can be programmed and modified separately for L, M and R.
Program Function	
Channel	L, M and R channel settings can be programmed, using the program keys, for the channels stored in ROM (NAME in the frequency data table), separately for each country and test.
Tuning Voltage	Upper and lower voltage limits for L, M and R can be programmed, using the data program keys, separately for each country and each test.
ATTENUATOR, AGC, AFT Power Supply	The set value can be programmed, using the data program keys, separately for each country and each test.
Rewriting	Programmed data can be rewritten at any time by pressing the DATA SET key, then using the data program keys.
Country	Select the IF selection data and RF marker data.
Test Selection	By test switch (maximum 16 keys) or step switch.
Voltage Display	Three 3-digit display (one decimal place) are provided by 3½ digit panel meters. • L/SINGLE tuning voltage • M tuning voltage • The following can be switched R tuning voltage, AGC voltage, AFT voltage, +B voltage
Current Display	Full load display of the +B power supplies (B_L, B_M, B_H, B_S, M_B, V_B and U_B) of the electronic tuner
Power Supply	AC100, 120, 220, 240V 50/60Hz 40VA
Size and Weight	350(W)x148(H)x450(D)mm, approx. 9kg 181(W)x62(H)x138(D)mm, approx. 600g
Accessories	Connecting cable (6), Transfer connector (1), AC cord (1)

Sweep Generator

TV-VHF/UHF 3CH DISPLAY SWEMAR GENERATORS

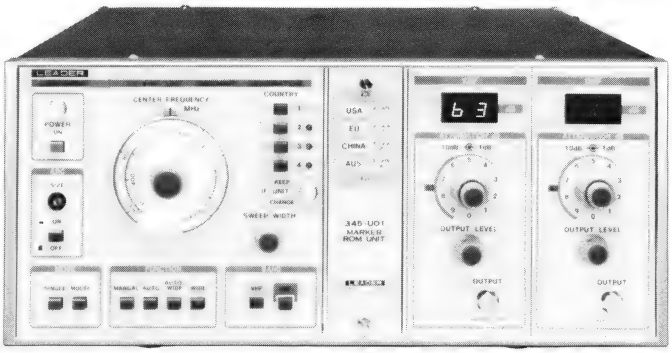
LSW-344A FOR SINGLE COUNTRY



NEW

VHF : 25 ~ 480MHz
UHF : 445 ~ 925MHz

LSW-345A FOR 4 DIFFERENT COUNTRIES



VHF : 25 ~ 480MHz
UHF : 445 ~ 925MHz

■ SPECIFICATIONS

● Sweep Section
LSW-344A and LSW-345A

BAND	VHF	UHF
Frequency Range	25~480MHz	445~925MHz
Center Frequency	30~470MHz	450~920MHz
Sweep Width	±5 ~ ±30MHz (±5~±150MHz at remote control LSW-344A only)	
Sweep Method	Variable capacitance diode	
Sweep Time	3.2ms, power source synchronization (100/120Hz)	
Linearity	Within 5%	
Output Voltage	0.5Vrms (75Ω load)	0.5Vrms (50Ω load)
Output Impedance	75Ω unbalanced	50Ω unbalanced
Output Flatness		
20MHz Sweep Time	Within ±0.5dB	Within ±0.5dB
All Band Sweep Time	Within ±1dB	Within ±1.5dB
Attenuation	0~63dB, 1dB step, programmed 0~20dB continuously variable, electronic	
Spurious	Less than –30dBc	
Horiz. Output Volt.	More than 10Vp-p (impedance 10kΩ)	

● Marker Section 344A-U01 (Sweep width: ±5~±30MHz)

IF Marker (Pulse)	2 points for a standard (PS marker) 1 point for an option
IF Marker Freq.	Accuracy : ±0.5% One IF band in the range of IF bands from 30 to 60MHz may be designated.
RF Marker (Bidry)	VHF: Three points in each of four bands, total twelve points UHF: Three points in each of two bands, total six points Option: 256 channels in both VHF and UHF, with remote control
RF Marker Freq.	Accuracy: Within ±50kHz As specified by the user for both VHF and UHF, VHF:30~470MHz, UHF:450~920MHz Minimum set unit (pitch) 250kHz

LSW-345A

Marker ROM Unit	345-U01 (standard), 345-U04 (CATV)
IF Unit	345-U02 (standard), 345-U03 (US-CATV), 345-U05 (JA-CATV)

● Auto Section LSW-344A and LSW-345A

IF Auto Trig. Range	0.3~300mVrms
Input Impedance	Approx. 75Ω
Allowable Input Deviation	More than 10dB between auto at multi-sweep time

● ARC Section LSW-345A (This ARC is available for LSW-344A as factory option only)

Amplitude, Range, and Polarity of Input Detection Signal	5mVp-p~200mVp-p, negative polarity (positive polarity is selectable by internal switch setting)
Output Voltage	Approx. 0.4Vp-p, positive polarity Change: Within ±2dB

● Others LSW-344A

BAND	VHF1, VHF2, VHF3, VHF4, UHF1, UHF2 In VHF1, VHF2, VHF3 and VHF4 or UHF1 and UHF2, only the marker frequency changes. The frequency range is VHF or UHF.

LSW-345A

BAND	VHF, UHF
COUNTRY	4 Different countries

LSW-344A and LSW-345A

MODE	SINGLE, MULTI (Dual, triple can be selected respectively for VHF/UHF by internal switch)
FUNCTION	MANUAL, AUTO, AUTO/WIDE, WIDE
Remote Control	Mode, Function, Band, Attenuator, Sweep Center Frequency, Sweep Width, Output Level and Country (LSW-345A only)
Power Supply	LSW-344A: AC100, 120, 200, 220, 240V (As specified by the user) 50/60Hz, approx. 51VA LSW-345A: AC100, 117, 220, 240V 50/60Hz, approx. 75W
Environmental Condition	Operating temperature range: 5°C ~ 40°C Operating humidity condition: should be less than 85% R.H.
Size and Weight	LSW-344A: 426(W)x148(H)x300(D)mm, approx. 11kg LSW-345A: 350(W)x148(H)x450(D)mm, approx. 15kg
Accessories	BNC~BNC cable (75Ω, 1m) LSW-344A . . . . . 6 LSW-345A . . . . . 7 BNC~clip cable (1m) . . . . . 1 BNC~BNC cable (50Ω, 0.6m) . . . . . 1 3-P power cord . . . . . 1 3-P~2-P conversion adaptor . . . . . 1 Time lag fuse . . . . . 1 Multi-pin plug (for remote connection) 24-P (LSW-345A only) 1 50-P 1

Sweep Generator

LSW-344A, LSW-345A

The LSW-344A and the LSW-345A are Swemar Generators with the built-in 2-band sweep functions of VHF/UHF designed for adjustments of VHF/UHF combination electronic tuners.
Simultaneous display of 2 or 3 channels of band characteristics of electronic tuner on an oscilloscope allows efficient adjustment works of electronic tuners.

■ FEATURES

- Built-in 2-band functions of VHF/UHF
  The LSW-344A & LSW-345A has all the necessary sweep and marker functions of VHF/UHF in a single unit. Thus it is the best suitable swemar generator for adjustments of VHF/UHF combination electronic tuners.
- Auto-tracking
  Automatic tracking of sweep center frequency to locate tuner characteristic curves of both VHF and UHF at the center of an oscilloscope screen eliminates adjustments of measurement instruments so that it is only necessary to turn the dial of a tuner.
- Auto-tracking + all-band sweeping
  By using the forward sweep for auto-tracking and the return sweep for all-band sweeping, accurate adjustment of the auto-tracking side is possible while observing tuner frequency position; thus it is possible to eliminate tracking errors.
- Remote control
  Remote control is available for all the necessary functions of electronic tuner adjustments.
- The instrument can select and display 2 or 3 channels of VHF and UHF respectively by the internal switch.
  The instrument may also be used for normal single channel sweeping.
- As the ARC (automatic response-level control) circuit is built in (This ARC is available for LSW-344A as factory option only.), trace display of a constant amplitude is available on an oscilloscope screen, though input amplitude of a signal applied to the FROM T.P. terminal changes. Clamping operation is possible even when the ARC circuit is turned off by the internal switch.

RF MARKER ROM UNITS, IF UNITS & LOCAL ADJUSTERS

RF MARKER ROM UNIT

345-U01 (Standard)

In the unit, a ROM which stores data for selecting RF markers and IF frequency bands of the four countries indicated on the country indication plate is provided. By changing the unit (on the front panel) markers of various countries can be displayed.
RF Marker (Birdy), Accuracy within ±50kHz, According to spec. for each country, 6 points for VHF and 6 points for UHF, 4 different countries (RF Markers for 4 countries are built-in) VHF: 30~470MHz, UHF:450 ~920MHz, Minimum set unit (pitch) 250kHz

345-U04 (CATV)

This unit has a ROM that stores sufficient data to select VHF-band RF markers for 256 channels for four countries, with 64 channels for each country. The change of channels is remotely controlled, thus it can be synchronized with the change of channels of a CATV converter.
RF Marker (Birdy), Accuracy within ±50kHz, According to spec.: 64CH for a country, in total 256CH for 4 countries 30~470MHz, Minimum set unit (pitch) 250 kHz, Channel Control: 6 bits binary control, Channel Indication: 00~63 binary control

IF UNIT

345-U02 (Standard)

This unit stores 4 IF bands. By selecting a country, the IF band of the selected country stored as the ROM data (on the front panel) in the 345-U01 can be automatically selected.
IF Marker (Pulse), 2 points for a standard (PS marker), 1 point for an option, Accuracy ±0.5%

345-U03 (US-CATV)

The 345-U03 generates IF marker output of LSW-345A and also it works for auto-tracking sweep.
This unit is designed for use with U.S. CATV converters.
IF Marker (Pulse), 4 points, Accuracy ±0.5%.
Built-in USA 2CH~4CH.

LOCAL ADJUSTERS

Additional devices
(attached to a main frame of LSW-345A)

LSW-345-L01

LSW-345-L02

350(W) x 49(H) x 450(D)mm, 4kg

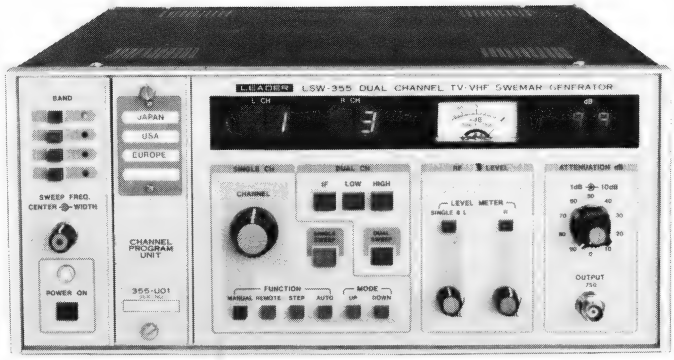
The 345-L01 is used to simultaneously check the band characteristics of CATV converters and the local frequency, and to simultaneously display two or three channels on the oscilloscope. This model has built-in US CATV IF channels.
The 345-L02 is used to simultaneously check the band characteristics of VHF tuners or CATV tuners, and local frequency. It also simultaneously displays two or three channels on the oscilloscope. This model has 8 built-in tuner IF channels.
When use this LOCAL ADJUSTERS, LSW-345A must be modified.
The marker ROM unit to be used is the 345-U04.

Local Adjuster	LSW-345-L01	LSW-345-L02
IF Frequency	① 55.25 MHz (US 2ch) ② 61.25 MHz (US 3ch) ③ 67.25 MHz (US 4ch)	① 58.75, ② 45.75, ③ 39.5 ④ 38.9, ⑤ 38.0, ⑥ 37.0 ⑦ 36.875, ⑧ 32.7MHz
Sweep Width	More than ±1MHz of each IF frequency	
Marker Frequency (Beat type or A3 type)	Birdy marker of each IF frequency (beat type) Pulse marker of each IF frequency and ±0.2MHz (A3 type)	
Local Adjustable type Local Marker Accuracy	Beat type or A3 type ±10kHz	

Sweep Generator

TV–VHF DUAL CH. SWEMAR GENERATOR

LSW-355



20MHz~310MHz

Built-in Memories of TV-VHF Channels of 4-Countries

The LSW-355 Swemar Generator is designed for adjustments of VHF tuners of varactor and mechanical types, CATV converters and IF amplifiers. The equipment uses the frequency synthesizer for the picture marker oscillation to enable adaptation to TV channels of various countries by simply replacing IC memories. Also, it can display two channels of frequency characteristics simultaneously on an oscilloscope in adjustments of varactor tuners.
You can effectively adjust TV tuners to increase your work productivity by using the equipment, since it uses the autotracking system so that sweeping automatically follows channels frequency when TV channel selector is turned.
The equipment is a general purpose Swemar Generator designed for VHF tuner adjustments with various remote control functions.
The LSW-355 has a wide range of applications in the following measurements:
(1) Band-pass characteristics of tuners
(2) Local oscillation frequency of tuners
(3) Overall band-pass characteristics of TV receivers
(4) Band-pass characteristics of IF amplifiers

■ FEATURES

- Easy Selection of Country Bands
- Picture Marker with Frequency Synthesizer
- Simultaneous Two Channel Display for Varactor Tuner
- Simultaneous Display of Band Pass Characteristics and Local Oscillator Frequency for Varactor Tuner

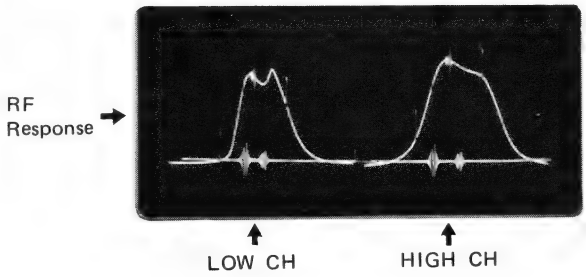
■ SPECIFICATIONS

Channel Program Unit 355-UO1	Memory IC package unit: TV channels of four countries can be stored in a single unit.
Sweep Oscillator Sweep Range Sweep Width	 20 ~ 310MHz Over 20MHz
Sweep Range Linearity	4.2 ms Within 2%
Output Voltage Output Deviation Output Flatness	1Vrms (with 75Ω load) ±1dB ±0.5dB
Attenuator	1dB x 10, 10dB x 9 Program control 0 ~ 15dB continuously variable
Horizontal Output Video Marker Output	10 Vp-p approx. 70mVrms
Marker Frequency	Picture; Picture marker frequency of each country frequency synthesizer. Sound; Selectable among ±4.5, ±5.5, ±6.0, ±6.5, and ±11.15MHz for picture frequency (optional frequency is available.)
Marking Method Marker Polarity Marker Accuracy	Birdy type (Picture), Pulse type (Sound) +, — change-over switch 1×10^{-4} (Picture), ±0.1% (Sound)
Local Oscillator Indication Range	 Coarse Birdy; ±10MHz of IF frequency IF Birdy; ±1.5MHz of IF frequency
Indication Linearity Marker Frequency Marker Accuracy	Within 10% IF frequency of each country 1×10^{-4}
Single Display Sweep Function	Manual, Remote, Step, Auto
Dual Display Sweep Indication/Output (Channel combinations for other countries as well as Japan and USA are available optionally.)	HIGH, LOW & IF Channel Selection

CH Output	High	Low	IF
Japan channel	4/12 CH	1/3 CH	IF
USA channel	7/13 CH	2/6 CH	IF

Remote Control	Attenuator (0 ~ 99dB, Program form) Level Control (0 ~ 15dB) Channel Control (Both 4 bit binary and 13-wire system are available, sequential step progress is also available.) Single / Dual Sweep High / Low / IF Up or Down (STEP / AUTO)
Power Supply	AC 100, 120, 220, 240V; 50/60Hz (50, 60Hz automatically switchable), 60VA approx.
Size and Weight	350(W) x 148(H) x 400(D)mm; 12kg approx.
Accessories	BNC ~ BNC cable . . . . . 4 BNC ~ Clip cable . . . . . 1 AC Cord (3-wire with ground, 2-pin adaptor) 1

■ RF RESPONSE OF VARACTOR TUNER



Sweep Generator

TV-VHF PLUG-IN SWEMAR GENERATOR

LSW-353A

20MHz~250MHz

The LSW-353A is an outstanding sweep generator for speedy and accurate testing and adjustment of the front-end and IF circuit in VHF TV receivers. Special circuitry has been utilized to reduce manipulation of controls to a minimum. Local oscillator circuit, in particular can be adjusted with the greatest of ease simultaneously with the tuning circuits. Use of the LEADER Instrument Oscilloscope of which there is a wide selection is recommended for highest efficiency in operation.

■ FEATURES

- Electronic channel switching by use of varactor tuning.
- Automatic selection of sweep signal at setting of tuner channel under test. (Option: Flexible coupling available for attachment to tuner shaft for direct selection.)
- Channel selection in timed sequence for continuous circuit adjusting operation.
- Digital display of channel in use.
- Wide sweep for locating detuned local oscillator circuit.
- Crystal controlled marker frequencies.
- Plug-in sweep-marker units available for VHF TV channels used in different countries.

■ RF PLUG-IN UNIT

	Country	Side Marker Frequency	IF Frequency
353A-U81	JAPAN	± 4.5 MHz	58.75 MHz
353A-U82	USA	± 4.5 MHz	45.75 MHz
353A-U83	EUROPEAN	± 5.5 MHz	38.9 MHz
353A-U84	ITALY	± 5.5 MHz	38.9 MHz
353A-U85	AUSTRALIAN	± 5.5 MHz	36.875 MHz
353A-U86	ANGOLA	± 6.0 MHz	39.5 MHz
353A-U87	FRANCE	± 11.15 MHz	28.05 MHz
353A-U88	OIRT	± 6.5 MHz	38.0 MHz
353A-U89	CHINA	± 6.5MHz	37.0 or 38.0 MHz
353A-U90	NEW FRANCE	± 6.5MHz	32.7MHz

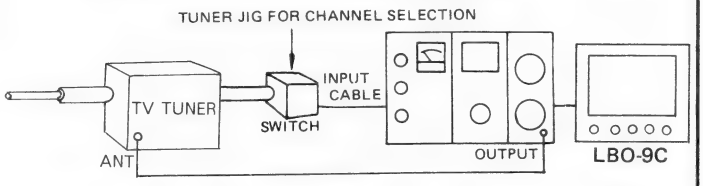
- Auto-tracking
- Just set channel for front-end and IF adjustments

■ SPECIFICATIONS

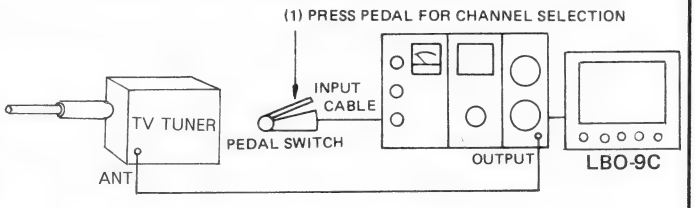
Main Frame	
Frequency Range	Depends on sweep plug-in unit used.
Output Impedance	75Ω, Unbalanced
Output Voltage	0.5 Vrms
Output Deviation	±1dB
Output Flatness	Within ±0.5dB
Attenuator	1dB x 10, 10dB x 8 Rotary type
Horizontal Output	10Vp-p
Marker Application	Superposed pulse and intensity modulation (10Vp-p)
Side Marker	Picture marker ±4.5 & ±5.5MHz up to four specified frequencies on order
Marker Accuracy	±0.1%
Local Oscillator	Sweep Width; 3MHz Coarse Marker; ±10MHz at IF freq. IF Marker; ±1.5MHz at IF freq.
Linearity	Within 10%
Marker Frequency	IF frequency of each country CH
Marker Accuracy	1×10^{-4}
Auto Input Sensitivity	3 ~ 6 mVrms
Auto Conserve Range	±2MHz
Power Supply	AC 100, 120, 220, 240V; 50/60Hz 30VA
Size and Weight	270(W) x 200(H) x 360(D)mm, 8.5kg.
RF Sweep Unit	
Sweep Range	Up to 13 channels (Example; 12-VHF TV and one IF)
Sweep Width	Over 20MHz
Linearity	Within 2%
Marker	At picture carriers (crystal controlled)
Marker Accuracy	1×10^{-4}
Size and Weight	80(W) x 183(H) x 293(D)mm; 3kg approx.

3 KINDS OF OPTIONAL APPLICATION

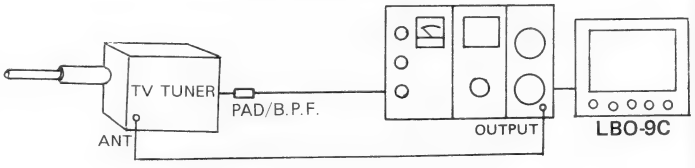
H-R (MANUAL-SWITCHING) SYSTEM



F-R (PEDAL-SWITCHING) SYSTEM



A-R (AUTOMATIC-SWITCHING) SYSTEM



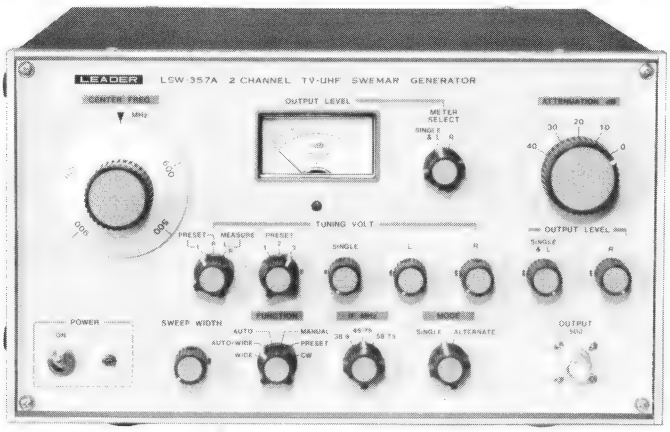
A-HR SYSTEM ----- A-R and H-R SYSTEM COMBINATION

A-FR SYSTEM -----A-R and F-R SYSTEM COMBINATION

Sweep Generator

TV–UHF DUAL CH. SWEMAR GENERATOR

LSW-357A



450MHz~920MHz

● Auto-tracking

The equipment is designed as a swemar generator for accurate, rapid adjustment and testing of frequency response and sensitivity of UHF TV receivers and IF amplifiers, and is able to simultaneously display two different channels of frequency response of a UHF tuner on the oscilloscope.

In combination with an oscilloscope, the equipment can be used for the following measurements:

- Band pass response of UHF tuner.
- Local oscillation frequency of UHF tuner.
- Overall frequency response of TV receiver (tuner and IF amplifier).

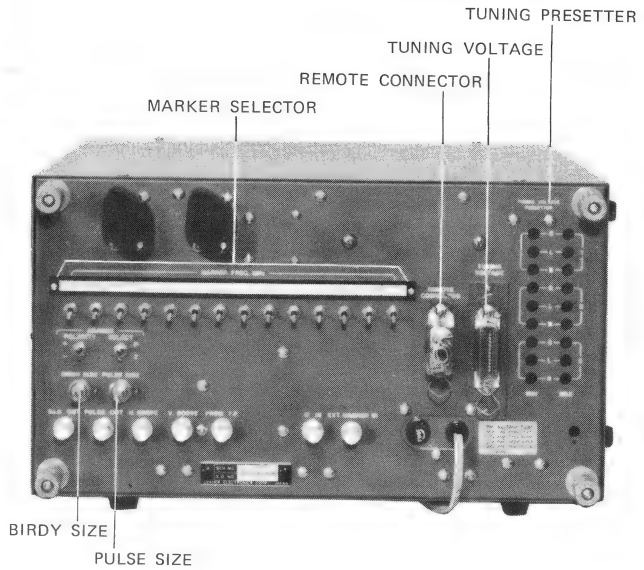
■ FEATURES

- Auto-tracking
  Sweeping center frequency automatically follows to place the display of tuner response curve in the middle of the oscilloscope screen so that no adjustment of sweep centering is required when the tuner dial is turned.
- Auto-tracking + all band sweeping
  By using sweeping durations for auto-tracking and return durations for all-band sweeping, accurate adjustment is available at the automatic side while watching the frequency location of a tuner, so that a tracking error can be eliminated.
- Remote control
  Remote control is available for sweeping center frequency, sweep width, and output voltage.
- 14 points of RF marker can be stored and they can be turned on and off independently.
- IF part can be changed by a switch for adjustments of tuners of 3 different frequencies (Japan, U.S.A. and Europe).
- Two channels of local oscillation adjustments are simultaneously available.
- A tuning voltage presetter used for varactor tuner is built in.

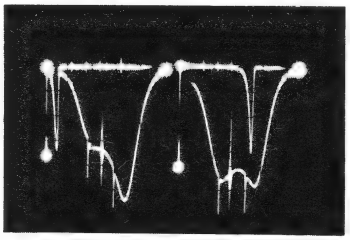
■ SPECIFICATIONS

Sweep Range Sweep Width	450 ~ 920MHz ±5 ~ ±100MHz, depending on the center frequency
Sweep Method Sweep Rate Linearity	Variable Capacitance Diode 100/120Hz Within 5%
Output Voltage Output Impedance Output Flatness Output Control	0.5Vrms (50Ω load) 50Ω, Unbalanced Within ±0.5dB at 20MHz sweep width 40dB in 10dB steps, fine adjuster 0 ~ 20dB (both L & R)
Marking Method Marker Frequency IF (Pulse) Marker	Pulse and Birdy type Change-over switch of 3 countries JAPAN; 58.75, 54.25MHz USA; 45.75, 41.25MHz EUROPE; 38.90, 33.40MHz
RF (Birdy) Marker Marker Accuracy	14 points of RF marker can be stored optionally by specification IF; ±0.5%, RF; 1 x 10^{-4}
IF Input Terminal IF Auto Trigger Range	Impedance 75Ω approx. 0.3 ~ 300 mVrms
Power Supply Size and Weight	AC 100, 120, 220, 240V. 50/60Hz approx. 13VA (Only unit 0.7VA) 350(W) x 198(H) x 360(D)mm 12kg approx.
Accessories	BNC ~ BNC cable . . . . . 2 BNC ~ Clip cable . . . . . 4 NP ~ BNC (50Ω) cable . . . . . 1 Amphenol connector (57-30240) . . 1

■ REAR PANEL



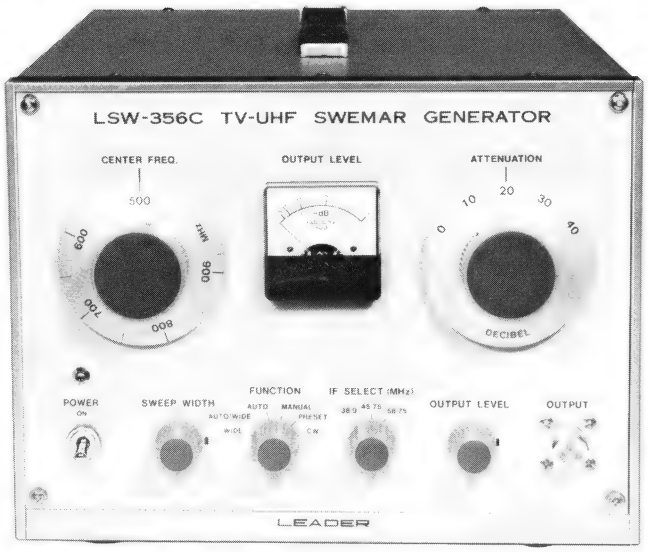
■ RF Response of UHF tuner



Sweep Generator

TV-UHF SWEMAR GENERATOR

LSW-356C



450MHz ~ 920MHz

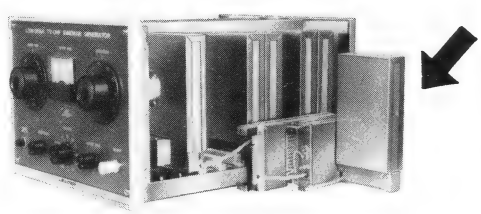
● Auto-tracking

This SWEMAR Generator is specially designed for rapid and accurate adjustment and inspection procedures in tuners and IF circuits for the TV UHF band. Used in conjunction with an alignment scope, the overall bandpass characteristics of the tuner and IF circuit, and the local oscillator frequency can be determined with great ease.

■ FEATURES

- Sweep frequency range is always centered automatically on the scope screen with the tuner channel setting.
- Full UHF band can be swept on the sweep return cycle enabling the exact location of the channel under test in the band.
- Remote control is possible in operation, such as setting the sweep center frequency range, sweep width and output level.
- Up to 14 frequency markers can be included.
- Up to 3 units of the different IF's in tuners used in various countries can be included.

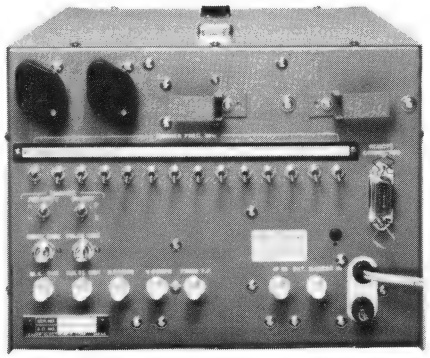
■ MARKER UNIT



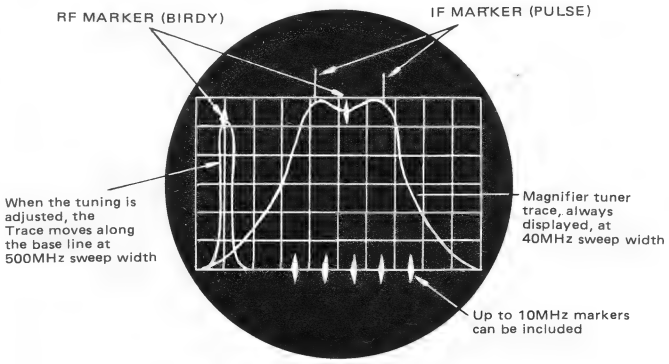
■ SPECIFICATIONS

Sweep Range Sweep Width	450 ~ 920MHz ±5 ~ ±100MHz, depending on the center frequency
Sweep Method Sweep Rate	Variable Capacitance Diode At power frequency, 50 or 60Hz,
Linearity Output Voltage Output Impedance	Within 5% 0.5Vrms (50Ω load) 50Ω, unbalanced
Output Flatness Output Attenuator Horiz. Scope Output	Whithin ±0.5dB at 20MHz sweep width 40dB in 10dB steps, fine adjuster (0 ~ 20dB) Over 10Vp-p
Marking Signal Output Marker Frequencies IF (Pulse) Marker RF (Birdy) Marker	Pulse and Birdy type Change-over switch of 3 countries JAPAN; 58.75, 54.25 MHz USA; 45.75, 41.25 MHz EUROPE; 38.9, 33.40 MHz 14 points of marker frequencies desired in a range of 450MHz to 920MHz can be stored optionally by specification, and each of them can be turned on and off independently. A crystal marker unit is provided per marker frequency.
Marker Accuracy IF Input Terminal IF Auto Trigger Range	IF; ±0.5%, RF; 1×10^{-4} Impedance 75Ω approx. 0.3 ~ 300 mVrms
Power Supply Size and Weight	AC 100, 120, 220, 240V. 50/60Hz approx. 11VA (Only unit 0.7VA) 270(W) x 200(H) x 360(D)mm, 9kg approx.
Accessories	BNC ~ BNC cable ..... 2 BNC ~ Clip cable ..... 4 NP ~ BNC (50Ω) cable 1

■ REAR PANEL



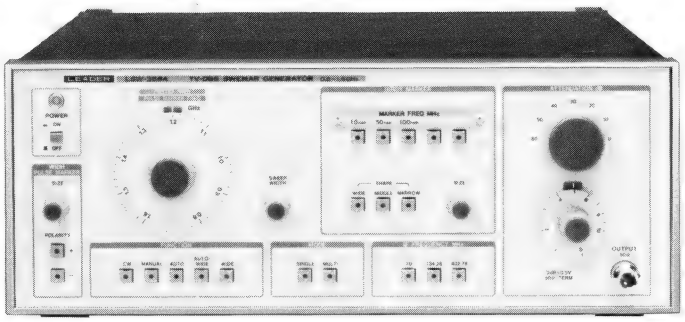
RF RESPONSE



Sweep Generator

TV-DBS SWEMAR GENERATOR

LSW-358A



NEW

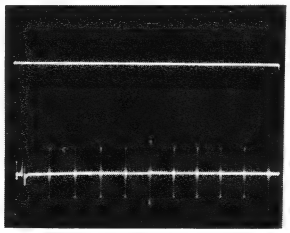
0.8~1.8GHz

LSW-358A is a swemar generator designed for use in the 1st IF range applied to TV receiver by satellite telecast. It is utilized with oscilloscope to check and adjust the 1st IF of TV-DBS.

■ FEATURES

- Auto-Tracking Sweep: Center sweep frequency is designed to track automatically to position characteristics wave of BS tuner at the center of oscilloscope display. It enables to observe response just by switching BS tuner channel without any operation of this instrument.
- Auto-Tracking + All Band Sweep: Forward sweep is used for auto-tracking and reverse sweep for all band sweep. It makes accurate measurement possible by observing frequency position of BS tuner and so no tracking error happens.
- All band (wide) sweep, manual sweep and CW function are provided to enable observation of wide frequency response and use as a simple signal generator.
- 3 IF frequencies of 70MHz, 134.26MHz & 402.78MHz are built-in.
- Wave observation by 2 or 3 channels is available to make adjustment of any influences in-between possible in efficient manner.
- Harmonic markers (birdy) of 10MHz, 50MHz & 100MHz enable accurate readings of frequencies. These markers can be identified easily by their amplitudes.
- It enables easy reading of frequency at WIDE sweep and its frequency to be center frequency at MANUAL sweep if variable marker (pulse) is used.
- Up to 2 spot markers (birdy) can be added as an option.

■ Harmonic marker (10, 50, 100MHz)

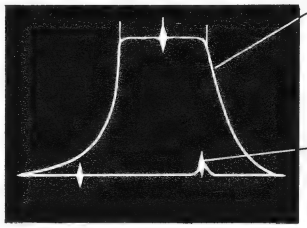


■ SPECIFICATIONS

Sweep Section	
Sweep Frequency Range	0.8~1.8 GHz
Sweep Width	±10 ~ ±500MHz
Sweep Method	Variable capacitance diode
Sweep Rate	3.2ms power synchronization (100/120Hz)
Output Voltage	0.5Vrms 50Ω load (+7dBm)
Output Impedance	50Ω unbalanced
Output Flatness	±1dB
Linearity	Within 10%
Attenuator	Rotary type 10dB x 6 Electronic type 0 ~ 10dB
Horizontal Output Voltage	Over 10Vp-p
Marker Section	
IF Marker (Pulse)	3 points: Accuracy ±0.5% (with polarity inversion switch)
IF Marker Frequency	Center frequency and Center frequency ±13.5MHz
70MHz	56.5, 70.0, 83.5 MHz
134.26MHz	120.76, 134.26, 147.76MHz
402.78MHz	389.28, 402.78, 416.28MHz
RF Marker	
Variable Marker	Only WIDE sweep: (with polarity inversion switch) Pulse: 1 point, Accuracy ±20MHz
Harmonic Marker	Birdy: 3 points, Accuracy ±0.1% Frequency: 10, 50, 100 MHz
Option Marker (Spot)	Birdy: 2 points, Accuracy ±0.1% Frequency Range: 0.8 ~ 1.8 GHz
External Marker Terminal	Birdy: 1 point Input voltage of about 70mVrms (−10 dBm) or more is necessary for external markers having identical amplitude width internal markers.
Birdy Marker Shape	Selectable at narrow, middle and wide
Auto-Tracking Section	Auto-Trigger Range: 1 ~ 300mVrms Input Impedance: approx. 75Ω Allowable Input Deviation: More than 10dB between auto at multisweep time
FUNCTION	CW, MANUAL, AUTO, AUTO/WIDE, WIDE
MODE	SINGLE, MULTI (Dual or triple can be selected by internal switch)
Remote Control	FUNCTION, MODE, IF, MARKER ON/OFF, BIRDY MARKER SHAPE, CENTER FREQ. volume, SWEEP WIDTH volume, OUTPUT LEVEL volume
Power Supply	AC100, 120, 220, 240V, 50/60Hz, approx. 35VA
Size and Weight	400(W) x 148(H) x 300(D) mm, approx. 9.5kg
Accessories	BNC~BNC cable . . . . . 6 BNC~clip cable . . . . . 1 NP~BNC 50Ω cable . . . . . 1 3P power cord . . . . . 1 3P-2P conversion adaptor . . . . . 1 Time lag fuse . . . . . 1 Multi-pin plug (for remote connection) 50 PIN 1

■ AUTO/WIDE FUNCTION RESPONSE OF VARACTOR TUNER

● **SINGLE Display**



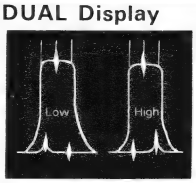
AUTO-Side waveform

When the tuner dial is turned, the response automatically follows and the P-S marker is always displayed at the same position. (This is the enlarged display of the wide-side waveform.)

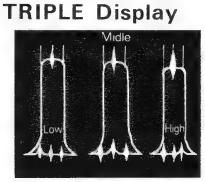
WIDE-Side waveform

The waveform moves to the left and the right sides on the return trace line and the tuning point is displayed.

● **DUAL Display**



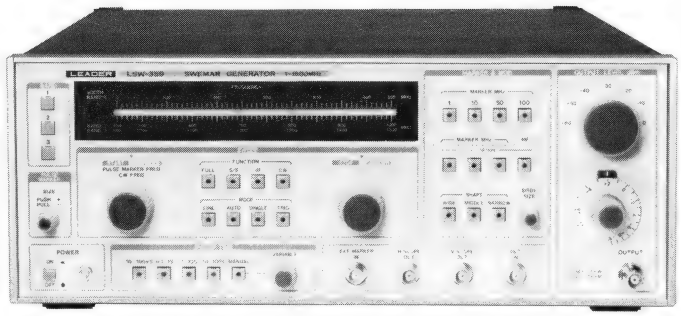
● **TRIPLE Display**



Sweep Generator

WIDE BAND SWEMAR GENERATOR

LSW-359



1～1500MHz (3 Bands)

It is best suited for use in research and development, inspection, and adjustment of VHF, UHF and DBS equipment.

■ FEATURES

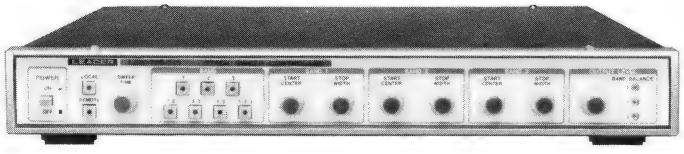
- Widely variable sweep widths enable viewing of frequency characteristics from wide to narrow bands.
- Single-sweep function and pen lift output terminal support an X-Y recorder.
- 1MHz, 10MHz, 50MHz, and 100MHz harmonic markers are amplified for easy recognition.
- Variable marker (pulses) simplifies reading of the frequency during a full sweep, which is set as the center frequency for an ΔF sweep.

■ SPECIFICATIONS

Sweep Freq. Range	1～1500MHz 3 Band 1～550MHz, 450～1000MHz 950～1500MHz
Center Frquency	1～1500MHz 3 Band 1～550MHz, 450～1000MHz 950～1500MHz
Dial Setting Accuracy	±20MHz (at +7dBm output)
Sweep Width Sweep Function Sweep Method	200kHz ～ 550MHz FULL, START STOP, ΔF, CW Variable Capacitance Diode
Output Voltage Output Impedance Output Flatness	+7dBm (50Ω) 50Ω Unbalanced ±0.5dB (at +7dBm output)
Linearity Spurious	Within 5% (at +7dBm output) Less than −30dBc
Attenuation Attenuator Accuracy	Rotary type 10dB x 6 Electronic type 17dB Band 1 ±0.5dB, Band 2 ±1.0dB, Band 3 ±1.5dB
Sweep Time Horiz. Output Voltage Sweep Mode	10ms — 100S More than 10Vp-p LINE, AUTO, SINGLE, MANUAL
Marker Method	Variable Pulse Marker (at FULL sweep) Birdy Marker
Marker Frequency	Harmonic Marker ..... 1, 10, 50, 100MHz Option Spot (1～1500MHz), Harmonic (2, 5, 20, 25MHz) Optionally, up to three harmonic markers or spot markers can be added.
Marker Accuracy	Less than 0.01%
External Marker	The LSW-359 has a terminal for external markers. Input voltage of about 70mVrms or more is necessary for external markers having identical amplitude width internal markers.
AM Modulation	Option, modulate frequency 1kHz uncalibrated.
Remote Control	BAND 1, BAND 2, BAND 3 Sweep Function changing (FULL, START/STOP, ΔF, CW) Sweep Mode changing (LINE, AUTO, SINGLE) Sweep Trigger and Sweep Time changing (10ms～100ms, 0.1～1s, 1～10s, 10～100s, MANUAL) Sweep time variable volume Start. Center volume, Stop. width volume Marker ON/OFF, electronic attenuator volume
Pen Lift Output	Contact on during sweep period
Power Supply Size and Weight	AC100, 120, 220, 240V 50/60Hz approx. 43W 400(W) x 148(H) x 400(D)mm approx. 12kg

STACK SWEEP CONTROLLER

LSW-359-S01



NEW

LSW-359-S01 is a controller designed to display BAND-1, 2, 3 simultaneously on CRT, in combination with LSW-359 swemar generator. It enables to observe frequency response in-between 2 bands and/or whole frequency response in 1 ～ 1500MHz.

■ FEATURES

- Band selection is available in 7 ways.
- START/STOP frequency, center frequency of ΔF sweep and frequency range can be set by each band.
- OUTPUT LEVEL in-between 2 bands can be adjusted for good balance.
- LOCAL/REMOTE switch enables to use LSW-359 only at LOCAL position.

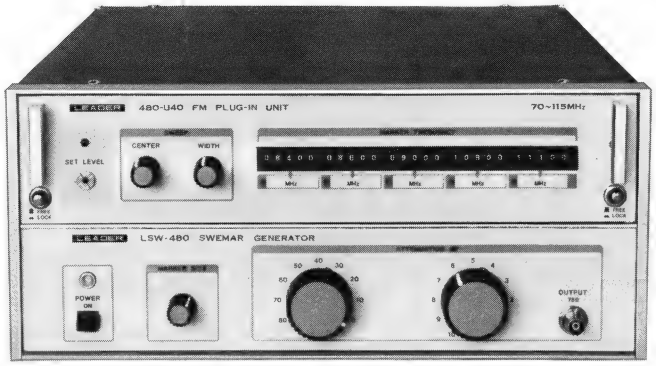
■ SPECIFICATIONS

Remote Function	Band Switch SWEEP TIME VARIABLE OUTPUT LEVEL: Remote OFF is available by rear switch.
BAND	7 (BAND 1, BAND 2, BAND 3, BAND 1-2, BAND 2-3, BAND 1-3, BAND 1-2-3)
Frequency Range	BAND 1 1 ～ 550MHz BAND 2 450 ～ 1000MHz BNAD 3 950 ～ 1500MHz BAND 1-2 1 ～ 1000MHz BAND 2-3 450 ～ 1500MHz BAND 1-3 1 ～ 550, 950 ～ 1500MHz BAND 1-2-3 1 ～ 1500MHz
OUTPUT LEVEL	17dB continuously variable Band balance can be set for BAND 1, 2, 3.
Power Supply Size and Weight	AC100, 120, 220, 240V, 50/60Hz, approx. 8VA 400(W)x50(H)x400(D)mm, approx. 3.5kg
Accessories	BNC～BNC cable . . . . . 2 36 pin AMPHENOL cable . . . . . 1 50 pin AMPHENOL cable . . . . . 1 Power cord . . . . . 1 Time lag fuse 1

Sweep Generator

UNIVERSAL SWEMAR GENERATOR

LSW-480



LW/BC-RF, SW-RF, FM-RF AM-IF, FM-IF, TV-SIF, CHROMA, VIF

Wide band sweep generator with various plug-ins

LSW-480 is a main frame to actuate a sweep signal generator by attaching U series plug-in-unit.
By exchanging the plug-in-unit, it enables the adjustment for tracking AM/FM-IF circuit of radio and TV-VIF.
In the LSW-480 installed power circuit supply to plug-in-unit, sweep generator circuit, output attenuator, etc. are included.

■ FEATURES

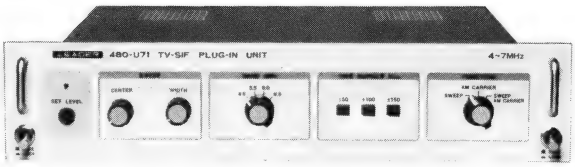
- Specifications change is easily available by replacing a plug-in unit.
- Centralized system is available for distributed 2 to 8 lines by use of a distributor with the LSW-480.
- Independent size control is available for the pulse marker and intensity modulation marker. They can be used simultaneously.
- Sweep output voltage of 1V is available, therefore centralized system of operation is available without using a distribution amplifier.

■ SPECIFICATIONS

MAIN FRAME	LSW-480
Output Impedance Output Attenuator	75Ω unbalanced 1dB × 10(0 ~ 10dB), 10dB × 8(0 ~ 80dB) Rotary type
V S W R Sweep Rate Sweep Time	Less than 1.2 25/30 Hz Approx. 37ms (50Hz), 30ms (60Hz)
Horizontal Output Marker Type	10Vp-p ± 0.5Vp-p Superposed pulse and intensity modulation,
Marker Output	0 ~ 1Vp-p (Superposed pulse) 0 ~ 10Vp-p (Intensity modulation)
Power Supply Size and Weight	AC100, 120, 220, 240V; 50/60Hz 350(W) x 148(H) x 400(D)mm, 7kg
Accessories	BNC~Clip cable 5

TV-SIF PLUG-IN UNIT

480-U71

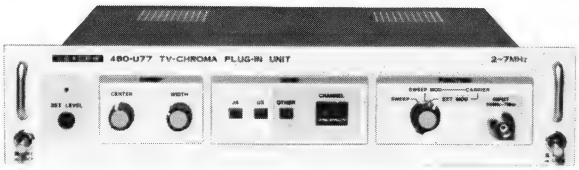


4.5, 5.5, 6.0 & 6.5MHz

Sweep Section	
Sweep Freq. Range	4.5, 5.5, 6.0, and 6.5±0.5MHz 4 bands
Center Frequency	4.5, 5.5, 6.0, and 6.5±0.2MHz 4 bands
Sweep Width	± 0.3MHz~±0.5MHz
Output Voltage	1 Vrms (into 75Ω load)
Output Flatness	Within ±0.1dB
Display Linearity	Within 3%
Marker Section	
Marker System	Pulse marker
Marker Frequency	4.5MHz: ±50kHz, ±100kHz, ±150kHz 5.5MHz: ±50kHz, ±100kHz, ±150kHz 6.0MHz: ±50kHz, ±100kHz, ±150kHz 6.5MHz: ±50kHz, ±100kHz, ±150kHz
Accuracy	Within ±0.1%
Pulse Marker Width	Approx. 50 μs
Modulation Section	
Carrier Frequency	4.5MHz, 5.5MHz, 6.0MHz, 6.5MHz
Carrier Output Voltage	1 Vrms
Modulation Freq.	Approx. 3kHz
Modulation Level	Approx. 30%
Size and Weight	350(W) x 75(H) x 300(D)mm, 3kg Approx.
Power Consumption	Approx. 30VA

TV-CHROMA PLUG-IN UNIT

480-U77



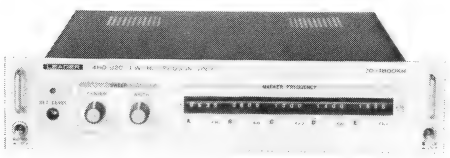
2~7MHz NTSC, PAL, SECAM

Sweep Section	
Sweep Freq. Range	2MHz ~ 7MHz (Center: 4.5 ± 1.5MHz)
Sweep Width	± 1.0MHz ~ ±2.5MHz
Output Voltage	1 Vrms (into 75Ω load)
Output Impedance	75Ω
Output Flatness	Within ±0.5dB
Display Linearity	Within 10%
Marker Section	
Marker System	Pulse marker, 4 Points
Marker Frequency	JAPAN & USA: 3.08,3.58,4.08,4.5MHz OTHER: Fixed(17ch.), Option (45ch, 2 ~ 7MHz)
Marker Setting Digits	4 digits, 1kHz step
Minimum Interval	1/30 of sweep width
Accuracy	Within ± 0.1%
Pulse Marker Width	Approx. 50 μs
Modulation Section	
Carrier Frequency	JAPAN: 58.75MHz, USA: 45.75MHz OTHER: Fixed(17ch.), Option (45ch, 25 ~ 80MHz, 5kHz step)
Carrier Output Voltage	0.3 Vrms (into 75Ω load)
Modulation Level	Approx. 30%
EXT. Modulation Freq.	400Hz ~ 7MHz
Size and Weight	350(W) × 75(H) x 300(D)mm, 3kg Approx.
Power Consumption	Approx. 35VA

Sweep Generator

LW/BC-RF PLUG-IN UNIT

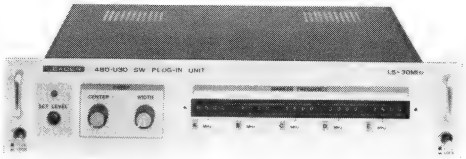
480-U20



70~1800kHz

SW-RF PLUG-IN UNIT

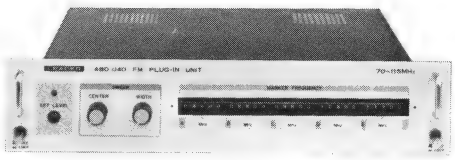
480-U30



1.5~30MHz

FM-RF PLUG-IN UNIT

480-U40



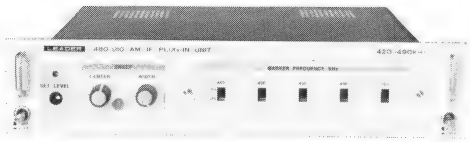
70~115MHz

■ SPECIFICATIONS

MODEL	480-U20 (LW/BC-RF)	480-U30 (SW-RF)	480-U40 (FM-RF)
Sweep Freq. Range Center Frequency Sweep Width Sweep Method	70kHz ~ 1800kHz 170kHz ~ 1700kHz 200kHz (min.) ~ 1300kHz (max.) Variable capacitance diode	1.5MHz ~ 30MHz 2MHz ~ 29.5MHz 1MHz (min.) ~ 28.5MHz (max.) Variable capacitance diode	70MHz ~ 115MHz 73MHz ~ 112MHz 6MHz (min.) ~ 30MHz (max.) Variable capacitance diode
Output Voltage Output Impedance Output Flatness Display Linearity	1 Vrms (into 75Ω load) 75Ω Within ± 0.5dB Within 10%	1 Vrms (into 75Ω load) 75Ω Within ±0.5dB Within 10%	1 Vrms (into 75Ω load) 75Ω Within ±0.5dB Within 10%
Marker System Marker Points Marker Frequency	Pulse marker 5 May be set within sweep range by digital switches.	Pulse marker 5 May be set within sweep range by digital switches.	Pulse marker 5 May be set within sweep range by digital switches.
Marker Setting Digits Minimum Interval Accuracy Pulse Marker Width	4 digits, 1kHz step 1/35 of sweep width Within ±0.1% ±1kHz Approx. 50μs	4 digits, 10kHz step 1/90 of sweep width Within ±0.1% Approx. 50μs	5 digits, 10kHz step 1/30 of sweep width Within ±0.1% Approx. 50μs
Size and Weight	350(W) x 75(H) x 300(D)mm, 2kg	350(W) x 75(H) x 300(D)mm, 2kg	350(W) x 75(H) x 300(D)mm, 2kg
Power Consumption	Approx. 28VA	Approx. 28VA	Approx. 28VA

AM-IF PLUG-IN UNIT

480-U10



420~490kHz

FM-IF PLUG-IN UNIT

480-U15

10~11.4MHz

TV-VIF PLUG-IN UNIT

480-U80

22~64MHz

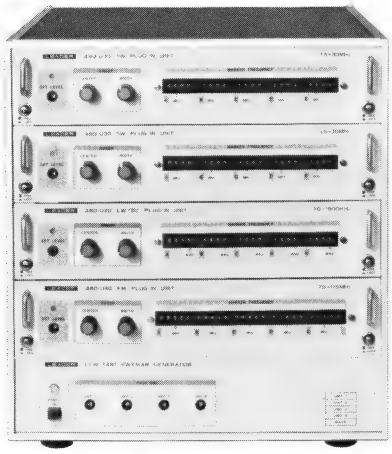
■ SPECIFICATIONS

MODEL	480-U10 (AM-IF)	480-U15 (FM-IF)	480-U80 (TV-VIF)
Sweep Freq. Range Center Frequency Variable Range	420kHz ~ 490kHz 455kHz 440kHz ~ 470kHz	10.0 ~ 11.4MHz 10.7MHz 10.3 ~ 11.1MHz	22 ~ 64MHz 26 ~ 60MHz
Sweep Width Sweep Method Output Voltage Output Impedance	30kHz (min.) ~ 70kHz (max.) Variable capacitance diode 1 Vrms (into 75Ω load) 75Ω	600kHz (min.) ~ 1400kHz (max.) Variable capacitance diode 1 Vrms (into 75Ω load) 75Ω	8MHz (MIN) ~ 16MHz (MAX) Variable capacitance diode 1 Vrms (into 75Ω load) 75Ω
Output Flatness Display Linearity	Within ±0.5dB Within 10%	Within ±0.5dB Within 10%	Within ±0.5dB Within 10%
Marker System Marker Points	Pulse marker 5	Pulse marker 5	Pulse marker 6 (2-Band)
Marker Frequency	445, 450, 455, 460, 465kHz	10.6, 10.65, 10.7, 10.75, 10.8MHz	May be set within sweep range by digital switches.
Marker Setting Digits	———	———	5 digits, 5kHz step
Minimum Interval Accuracy Pulse Marker Width	5kHz Within ±0.1% Approx. 40μs	50kHz Within ±0.1% Approx. 40μs	1/60 of sweep width Within ±0.1% Approx. 50μs
Size and Weight	350(W) x 75(H) x 300(D)mm, 2kg	350(W) x 75(H) x 300(D)mm, 2kg	350(W) x 75(H) x 300(D)mm, 2.5kg
Power Consumption	Approx. 18VA	Approx. 18VA	Approx. 28VA

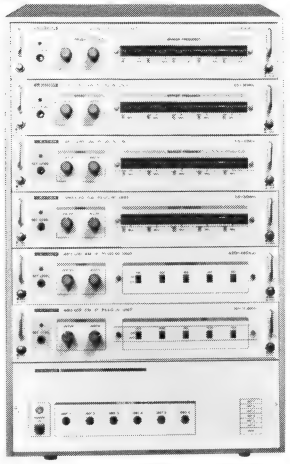
Sweep Generator

CENTRALIZED SWEMAR GENERATORS

LSW-1481



LSW-1482



Multiple Use of the Plug-in Units

The LSW-1481 and LSW-1482 are combined with LSW-480 plug-in units to form a centralized swemar generator. Up to four LSW-1481's or up to six LSW-1482's can be run in parallel with all LSW-480 units (eight models) to enable simultaneous output and distribution of four or six bands. Synchronized operation with a single-function LSW-480 simplifies band increases or decreases. Distributors, attenuators, loop antennas, cables, and connectors are available as centralization accessories.

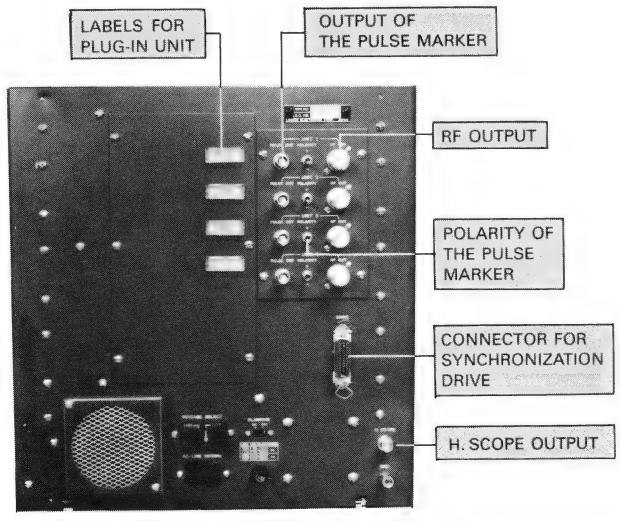
■ FEATURES

- Up to four plug-in units (LSW-1481) or up to six plug-in units (LSW-1482) can be housed in a single unit for four- or six- frequencies centralization. Changing specifications can be met by simply interchanging plug-in units.
- A single LSW-1481 and LSW-1482 can be used with plug-in units and distributors to optionally centralize sweep generator system up to two to eight distributions.
- Up to three plug-in units for TV band can be housed in LSW-1481.

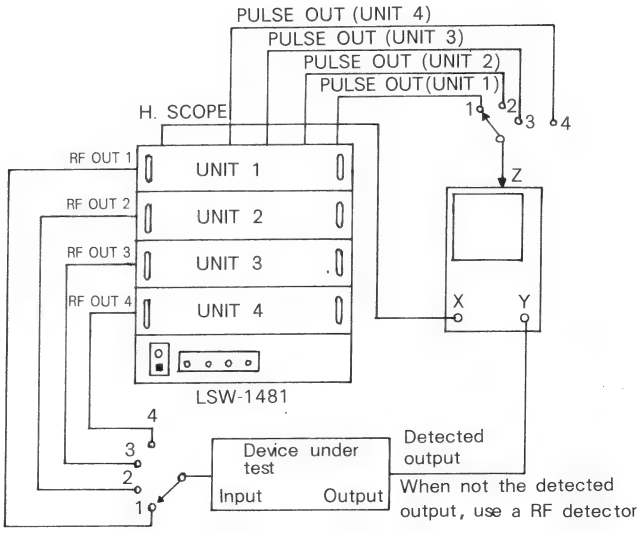
■ SPECIFICATIONS

Output Impedance Frequency Range	75Ω Unblanced 70 kHz ~ 300 MHz
Sweep Speed Sweep Time Horizontal Output	25/30 Hz power synchronization sawtooth wave Approx. 37ms(50Hz), 30ms(60Hz) 10Vp-p ± 0.5Vp-p
Marker Type	Pulse
Marker Output	0 ~ 10Vp-p with positive/negative polarity switching
Power Supply	AC 100, 220 and 240V
Size and Weight	LSW-1481: 367(H) x 350(W) x 400(D) mm Approx. 15kg LSW-1482: 550(H) x 350(W) x 400(D) mm Approx. 20kg
Accessories	3P power cord . . . . . 1 3P-2P conversion adaptor . . . . . 1 Fuse . . . . . 1 Blank panel (only LSW-1481) 1

■ LSW-1481 Rear Panel



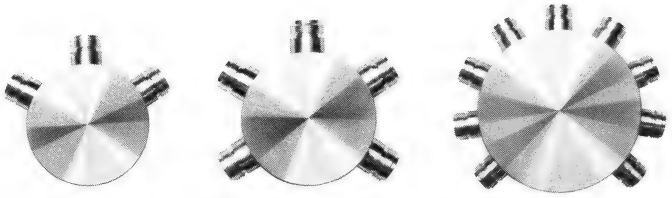
■ Four different frequencies measurements using four position band switches



Accessories for Centralization

DISTRIBUTORS

LDR-1512-02 LDR-1512-04 LDR-1512-08



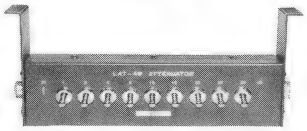
75Ω Resistor Type Distributors

Model	No. of Line	Dist. Loss	Specifications commom to each model
LDR-1512-02	2	6dB	Input/Output Impedance . . . 75Ω
LDR-1512-03	3	9.5dB	Frequency Range . . . DC~150MHz
LDR-1512-04	4	12dB	V.S.W.R. . . . less than 1.2
LDR-1512-06	6	15.5dB	Power . . . ½W
LDR-1512-08	8	18dB	Connector . . . N—Jack
LDR-1512-10	10	20dB	
LDR-1512-12	12	21.6dB	

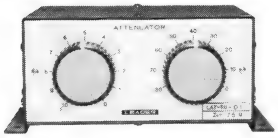
50Ω Resistor Type Distributors are available as LDR-1515-00.

VARIABLE ATTENUATORS

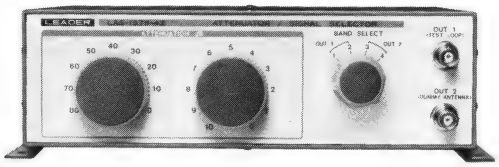
LAT-48



LAT-50-01 (75Ω)
LAT-50-05 (50Ω)



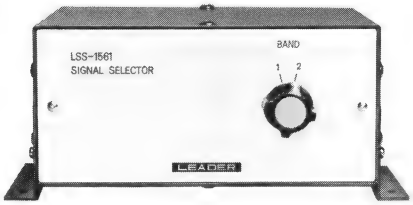
LAS-1575-42



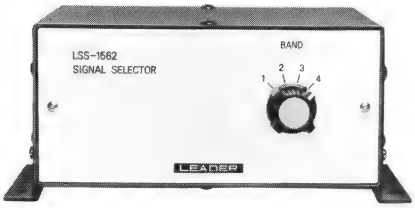
Model	Impedance	Attenuation	Frequency Range	V.S.W.R.	Power	Connectors
LAT-48	75Ω	1, 2, 3, 6, 10, 10, 20, 20, 20 dB	DC ~ 150MHz	less than 1.3	0.1W	M · J–M · J (UHF · J-UHF · J)
LAT-50-01	75Ω	1 dB× 10 10 dB× 8	DC ~ 300MHz	less than 1.3	1/8W	BNC · J-BNC · J
LAS-1575-42	75Ω	1 dB× 10 10 dB× 8	DC ~ 150MHz	less than 1.5	1/8W	4 · inputs ..... N · J Marker in/out ... BNC · J 2 · outputs ..... BNC · J
LAS-1575-63	75Ω	1 dB× 10 10 dB× 8	DC ~ 150MHz	less than 1.5	1/8W	6 · inputs ..... N · J Marker in/out ... BNC · J 3 · outputs ..... BNC · J

SIGNAL SELECTORS

LSS-1561



LSS-1562

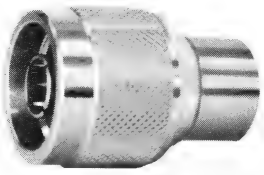


Those are used for manually switching a multiple of sweep/marker signals at the adjustment bench when their selections are required. Unused sweep signal is terminated by the terminating resistor to avoid mismatching. Two types of the selectors are available; one is for 2-frequency switching and the other is for 4-frequency switching.

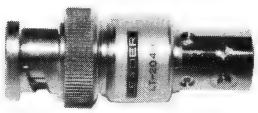
Model	Switch Band	Impedance	RF Freq. Range	RF Flatness	RF Isolation	Marker Freq. Range	Connectors
LSS-1561	2	75Ω	DC ~ 120MHz	± 1dB	20dB @ 120MHz	DC ~ 500kHz (–3 dB)	RF 2 · inputs ... N · J Marker in/out ... BNC · J RF output ..... N · J
LSS-1562	4	75Ω	DC ~ 120MHz	± 1dB	20dB @ 120MHz	DC ~ 500kHz (–3dB)	RF 4 ·inputs .... N · J Marker in/out... BNC · J RF output ..... N · J

TERMINATION RESISTORS

■ Termination Resistors



■ Through Type Termination Resistors

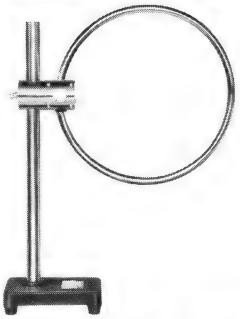


Model	Imped-ance	Frequency Range	Con-nector	Spec. common to each model
LD-1545-75	75Ω	DC~300MHz	BNC-P	V.S.W.R. ... less than 1.05
LD-1546-75	75Ω	DC~300MHz	N-P	
LD-1545-50	50Ω	DC~1GHz	BNC-P	Power 1/4W
LD-1546-50	50Ω	DC~1GHz	N-P	

Model	Imped-ance	Frequency Range	V.S.W.R.	Power	Connector
LT-1551	75Ω	DC~300MHz	less than 1.3	1/2W	BNC
LT-2049	50Ω				

TEST LOOPS

LPA-070 : 50Ω
LPA-071 : 75Ω



It is also so-called as loop antenna. It is used to generate the required standard field strength in combination with variable attenuator, for adjustments and checking of AM radio receivers which have a built-in bar antenna.

Model	LPA-070	LPA-071
Freq. Range	0.1 ~ 30 MHz	0.1 ~ 30 MHz
Impedance	50Ω	75Ω
Connector	BNC—Jack	BNC—Jack
Accessory Cable	BNC · P—BNC · P 1m	BNC · P—BNC · P 1m

UHF BALUN

LBN-1555-50

50Ω: 300Ω
400~900MHz
VSWR less than 1.2

Sweep Generator

VHF SWEEP GENERATOR

LSW-350

5MHz ~ 300MHz

■ SPECIFICATIONS

Sweep Frequency Range	5 ~ 300MHz
Sweep Width at Full Width at Δf	 10 ~ 300MHz 0 ~ 50MHz (±25MHz, max., of center frequency except extreme ends); continuously variable.
Output Voltage Output Impedance Output Flatness	0.5Vrms, max., into 75Ω load 75Ω; unbalanced Within ± 0.5dB at 5 ~ 300MHz sweep
Output Control	0 ~ 80dB in 10dB steps, and −10 to 0dB continuously variable between steps.
Sweep Linearity Sweep Rate Horizontal Output	Within 5% At power frequency, 50 or 60Hz Over 10Vp-p
Marker Frequencies Birdy Marker Shape	Harmonics of 1, 10, and 50MHz, singly or in combination. Selectable at narrow, middle and wide.
External Marker Input Operating Temperature	Terminals provided 0 to +40°C
Power Supply Size and Weight	AC100, 120, 220, 240V; 50/60Hz 25VA approx. 270(W) x 200(H) x 360(D)mm 8kg approx.
Accessories	BNC ~ BNC cable . . . . . 2 BNC ~ Clips cable . . . . . 2 Detector 1

● WIDE BAND SWEEP Full Band/ Δf-Sweep
● 5 Markers of 1, 10, 50MHz and optional 2

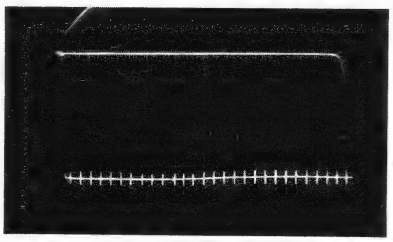
The LSW-350 is most suited for use in development, testing and inspection of circuits and equipment operating in the VHF bands, up to 300MHz.

The generator is particularly useful in adjustments of CATV equipment, such as booster amplifiers, tilt amplifiers, signal distributors and filters.

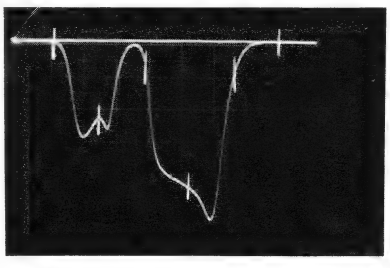
■ FEATURES

- Two sweep modes - full range coverage and 0 - 50MHz at any portion within the range.
- Use of varactor-tuned oscillator for high stability and reliability.
- Superposed harmonic markers used for accurate frequency marking or checking.
- Birdy marker applicable when supplied from an external source.
- Marker width variable for ease in readout, depending on the sweep width.

■ FULL SWEEP WIDTH 10MHz MARKERS



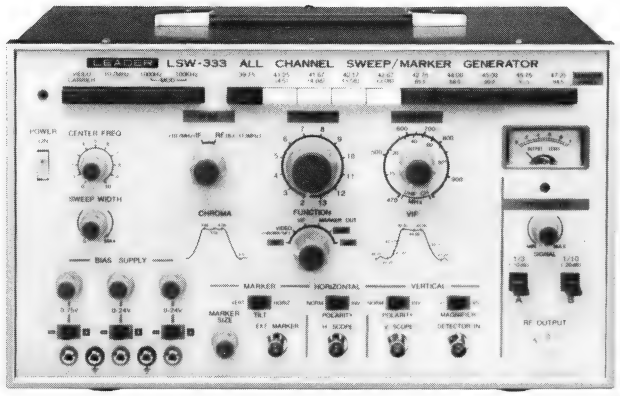
■ BOOSTER AMPLIFIER WIDTH 50MHz MARKERS



Sweep Generator

ALL USA CHANNEL SWEMAR GENERATOR

LSW-333



10.7, 83-113, 1.8-5.5, 43.5MHz VHF 2-13ch, UHF 470-890MHz

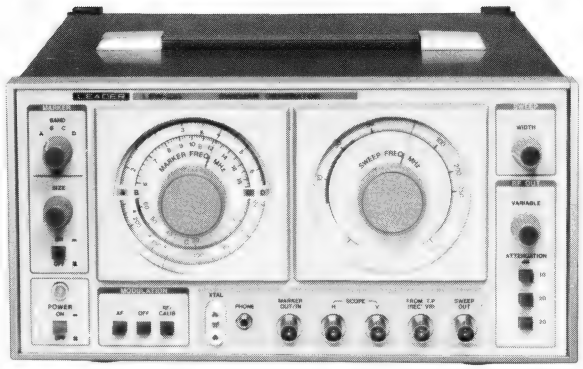
The LSW-333 is an outstanding sweep signal generator for use in accurate checks and adjustments of color TV receivers. In the VHF band, sweeps are provided for the twelve channels; in addition, full coverage is provided for the UHF band. All important circuits (tuners, video IF, sound IF, chroma and traps) can be checked individually or in combination. Moreover, the IF and tuner circuits in FM receivers can be checked with the sweep signals.

■ SPECIFICATIONS

Sweep Bands	FM–IF; 10.7 ±1MHz, FM–RF; 83 ~ 113MHz, VIDEO; 1.8 ~ 5.5MHz (CHROMA & SIF) VIDEO; 43.5 ±8MHz (Video sweep modulation, 0 ~ 6MHz) TV–VHF; 2 ~ 13ch ±8MHz, or wider TV–UHF; 470 ~ 890MHz
Output Voltage Output Impedance Output Flatness	Over 100mVrms into 75Ω 75Ω, unbalanced Within ±2dB at rated sweep width for VHF and FM, and at ±20MHz width for UHF.
Output Control	30dB in 10dB steps at VHF, UHF and FM; additional 40dB continuously variable at VHF and FM only
Marker Freq. FM–IF FM–RF CHROMA/SIF	 10.7MHz 85.5, 88, 90, 91.5, 94.5MHz. 3.08, 3.58, 4.08, 4.50MHz.
Video IF	39.75, 41.25, 41.67, 42.17, 42.67, 42.75, 44.00, 45.00, 45.75, 47.25MHz
TV Channels	For Video and sound carriers, adjacent video and sound traps, three on flat portion, color subcarrier and side bands; input provided for external marker.
Marker Method	Birdy type
Modulation Marker Tilting Vertical Magnifier	AM with 1kHz and 100kHz side marker applicable on all markers. Vertical or horizontal X1 and X5
Bias Supply Voltages	Two 0 to ±24V outputs; regulated One 0 to ±75V output; unregulated
Power Supply Size and Weight	AC 100, 120, 220, 240V, 50/60Hz; 10VA 350(W) x 224(H) x 242(D)mm; 5.2kg
Accessories	Connection cable ... 3, Direct probe ... 1 Bias supply output lead ... 3 Output matching cable ... 1

TV-FM SWEMAR GENERATOR

LSW-251



2MHz~310MHz

The LSW-251 Swemar Generator is an integrated sweep and marker generator used for wide frequency band. An outstanding width of the generating frequency range provides the users with various applications, including tests and adjustments of TV receivers, FM tuners, CATV equipment, and tuning coils. The instrument is a requisite particularly for the after-sales service of TV receivers.

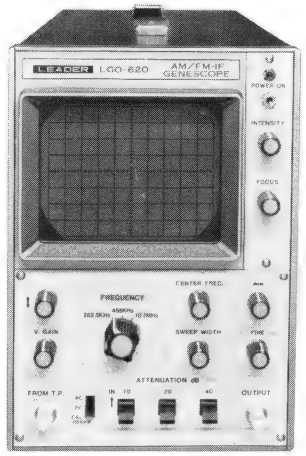
■ SPECIFICATIONS

Sweep Generator Frequency Range Sweep Width Sweep Method Sweep Rate Linearity Output Voltage Output Impedance Attenuator	 2 ~ 310MHz (1 band) Maximum 20MHz Variable capacitance diode At 50/60Hz (Synchronous power frequency), triangular wave Within 5% Approx. 100m Vrms 75Ω, unbalanced Continuously variable from 0dB ~ 10dB, by push-buttons (for 10dB, 20dB, and 20dB)
Marker Generator Frequency Range Frequency Accuracy Crystal Oscillator Internal Modulation Accessory Circuit	 2 ~ 250MHz (four bands) Band A: 2 to 6.5MHz Band B: 6 to 18.5MHz Band C: 18 to 65 MHz Band D: 60 to 250MHz (second harmonics) Within ±1% 1 to 14MHz (quartz crystal replaceable) Approx. 1kHz (amplitude modulation) Marker Adder
Accessories Power Supply Size and Weight	BNC~clips cables 2 units BNC~BNC cables 2 units Matching pad, 75 ~ 300Ω (200Ω) [LBN-07X] 1 unit, Earphone 1 unit 4.5MHz or 5.5MHz crystal (FT-243) 1 unit AC 100V 50/60Hz, approx. 12VA (120V, 240V) 300(W) x 148(H) x 250(D) mm, approx. 4.5kg

Genescope

IF (AM/FM) GENESCOPE

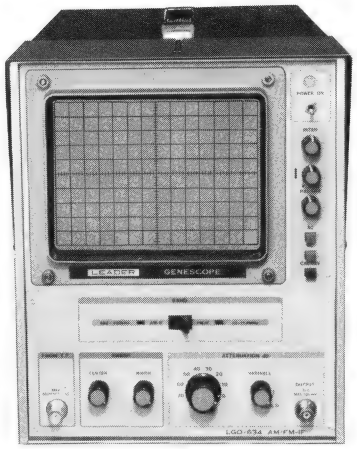
LGO-620



262.5kHz/455kHz, 10.7MHz

The LGO-620 is most suited for use in production line testing of the IF circuits in AM and FM radio receivers. It is a combination of a three-band sweep generator with markers, a 130mm (5") scope, and associated circuits. The AM IFs can be tested at 262.5kHz and 455kHz, and the FM IF at 10.7MHz.

LGO-634

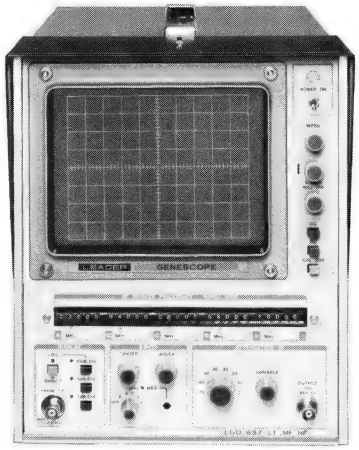


455kHz, 10.7kHz

The LGO-634 is a genescope particularly designed for high accuracy adjustment/testing of IF amplifier circuits and coils of AM/FM 2-band radio receivers at the assembly plant. It includes in a single unit the alignment-scope and swemar-generator functions for the AM-IF 455-kHz and FM-IF 10.7-MHz bands, thus its operation is very easy.

LF/MF/HF GENESCOPE

LGO-637



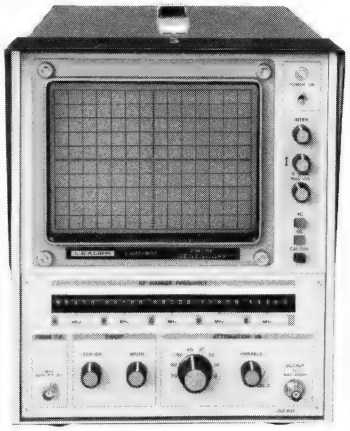
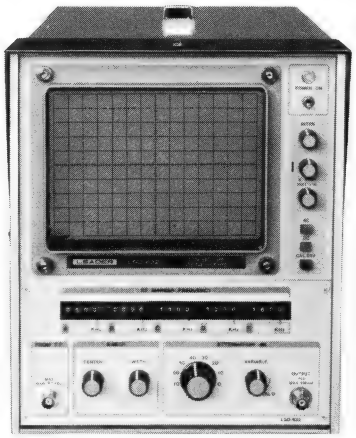
100kHz~12MHz

The LGO-637 Genescope consists of an alignment scope and a swemar generator housed in a single case for simple adjustment and servicing of high-frequency circuits operating in LF, MF, and HF bands. It also incorporates a log amplifier to provide high-precision adjustment and servicing of coils, filters, etc.

■ SPECIFICATIONS

MODEL	LGO-620	LGO-634	LGO-637
Sweep Frequency Range	AM-FM: 227.5~297.5kHz/420~490kHz FM-IF: 10.2~11.2MHz	AM-IF: 420kHz~490kHz FM-IF: 10MHz~11.4MHz	100kHz~12MHz
Center Frequency	AM-IF: 262.5kHz/455kHz, FM-IF: 10.7MHz	AM-IF: 455kHz, FM-IF: 10.7MHz	350kHz~11.75MHz variable
Center Freq. Variable		AM-IF: 440kHz~470kHz FM-IF: 10.3MHz~11.1MHz	———
Sweep Width	AM-IF: ±35kHz FM-IF: ±500kHz	AM-IF: 30kHz(MIN)~70kHz(MAX) FM-IF: 600kHz(MIN)~1400kHz(MAX)	500kHz(MIN)~11.9MHz(MAX)
Output Voltage	0.3Vrms (into 75Ω load)	100mVrms (into 75Ω load)	1Vrms (into 75Ω load)
Output Flatness	Within ±0.5dB (at max. sweep width)		
Display Linearity	Within 5%	Within 10%	
Attenuator	10, 20, 40dB Snap. 0~10dB variable	10dBx7, rotary type, 0dB to 10dB continuously variable	
Sweep Rate	25/30Hz saw-tooth wave of AC line sync.		
Sweep Time	Approx. 25ms	Approx. 37ms (50Hz), 30ms (60Hz)	
Log Amplifier Frequency Response Input Level Vertical Sensitivity	———	———	100kHz~12MHz (within ±2dB) 1mVrms~1Vrms (impedance: 500kΩ) 10, 5, 1dB/div switchable
Marker Marking Method	Intensity marker or intensity pulse marker, + polarity	Intensity marker or intensity pulse marker, ± polarity	
Marker Frequency	AM-IF: 252.5/262.5/272.5kHz AM-IF: 445/455/465kHz FM-IF: 10.6/10.7/10.8MHz	AM/FM-IF 5 points each AM-IF: 445, 450, 455, 460, 465kHz FM-IF: 10.6, 10.65, 10.7, 10.75, 10.8 MHz	5 points Available within sweep range by digital switches. Sweep width is limited to: 6 MHz for setting marker frequencies 200kHz~400kHz, 2MHz for setting marker frequencies 100kHz~199kHz
Marker Setting Signal	———	———	5 digits, 1kHz step
Minimum Interval	———	AM-IF: 5kHz, AM-IF: 50kHz	Approx. 1/30 of all sweep width
Accuracy	Within ±0.1% at max. sweep width	Within ±0.1%	Within ±0.1% (Over 1MHz) Within ±1kHz (Less than 1MHz)
Oscilloscope Vertical Sensitivity	10mV/cm	5mV/div, Polarity: +/— switchable	
Bandwidth	DC/3Hz~50kHz	DC/3Hz~50kHz (—3dB)	DC/3Hz~Over 50kHz
Vertical Attenuator	1/10 (20dB) x 1		
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 17VA	AC100,120,220,240V,50/60Hz,25VA	AC100, 120, 220, 240V, 50/60Hz, 45W
Size and Weight	175(W)x248(H)x380(D)mm, 5.5kg	230(W)x270(H)x400(D)mm, 10kg	230(W)x270(H)x400(D)mm, 12kg

Genescope

FM GENESCOPE	LW/BC GENESCOPE	SW GENESCOPE
LGO-631〔-01〕	**LGO-632〔-01〕**	**LGO-633〔-01〕**
		
RF : 73～113MHz **〔IF : 10.0～11.4MHz〕**	**RF : 70～1800kHz** **〔IF : 420～490kHz〕**	**RF : 1.5～30MHz** **〔IF : 420～490MHz〕**

LGO-631, 632 and 633 are specially designed for tracking and high frequency circuit adjustment/testing of FM, LW/BC, SW bands in a mass-production plant of radio and consists of an alignment scope and sweep generator enclosed in a single case with ease of operation and high accuracy.

- Bright, easy-looking, high accuracy display is available for measurement by use of high intensity 8-inch rectangular CRT screen.
- Simple operation by reduced number of operation knobs.
- Accurate 5 points digital markers, and reading/setting of marker frequency by the digital switches on the front panel.

LGO-631-01, 632-01 and 633-01 are genescopes which have IF bands in addition to the RF bands provided with the LGO-631, 632 and 633, respectively.

■ SPECIFICATIONS

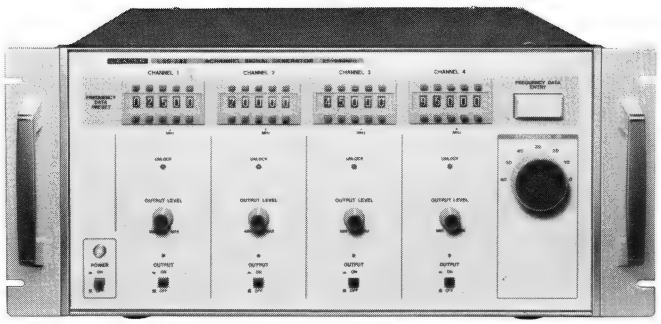
Note that the specifications for the LGO-631-01, LGO-632-01 and LGO-633-01 are indicated by parentheses [ ] in the description.

MODEL	LGO-631 [-01]	LGO-632 [-01]	LGO-633 [-01]
Sweep			
Frequency Range Center Frequency Sweep Width	73MHz~113MHz [10.0~11.4MHz] 76MHz~110MHz [10.3~11.1MHz] MIN: 6MHz [600kHz] MAX: 30MHz [1400kHz]	70kHz~1800kHz [420~490kHz] 170kHz~1700kHz [440~470kHz] MIN: 200kHz [30kHz] MAX: 1300kHz [70kHz]	1.5MHz~30MHz [420~490kHz] 2MHz~29.5MHz [440~470kHz] MIN: 1MHz [30kHz] MAX: 28.5MHz [70kHz]
Sweep Method Output Voltage	Variable capacitance diode 100mVrms (into 75Ω load)	Variable capacitance diode 100mVrms (into 75Ω load)	Variable capacitance diode 100mVrms (into 75Ω load)
Output Flatness Display Linearity	Within ±1dB (at max. sweep) Within 10%	Within ±1dB (at max. sweep) Within 10%	Within ±1dB (at max. sweep) Within 10%
Attenuator	10dB x 7, 0dB ~ 10dB variable	10dB x 7, 0dB ~ 10dB variable	10dB x 7, 0dB ~ 10dB variable
Sweep Rate Sweep Time	25/30Hz saw-tooth wave of AC line sync Approx. 37ms (50Hz), 30ms (60Hz)	25/30Hz saw-tooth wave of AC line sync Approx. 37ms (50Hz), 30ms (60Hz)	25/30Hz saw-tooth wave of AC line sync Approx. 37ms (50Hz), 30ms (60Hz)
Marker			
System	Intensity marker or intensity pulse marker		
Frequency	May be set within sweep range by digital switches		
	[10.60, 10.65, 10.70, 10.75, 10.8MHz]	[445, 450, 455, 460, 465kHz]	[445, 450, 455, 460, 465MHz]
Setting Digits Number of Markers	5 digits, 10kHz step RF: 5 [IF: 5]	4 digits, 1kHz step RF: 5 [IF: 5]	4 digits, 10kHz step RF: 5 [IF: 5]
Interval (Min.)	1/30 of sweep width	1/35 of sweep width	1/90 of sweep width
Accuracy	Within ±0.1%	Within ±0.1% ±1kHz [Within ±0.1%]	Within ±0.1%
Size	0cm to 3cm, with polarity inversion switch		
Pulse Marker Width	Approx. 100μs	Approx. 100μs	Approx. 100μs
Oscilloscope			
CRT	C8S44P1, 8" rectangular type, 5kV	C8S44P1, 8" rectangular type, 5kV	C8S44P1, 8" rectangular type, 5kV
Vertical Sensitivity Bandwidth	5mV/div DC or 3Hz ~ 50kHz (–3dB)	5mV/div DC or 3Hz ~ 50kHz (–3dB)	5mV/div DC or 3Hz ~ 50kHz (–3dB)
Vertical Attenuator	1/10 (20dB) x 1	1/10 (20dB) x 1	1/10 (20dB) x 1
Vertical Polarity Calibrator	+/– switchable 50mVp-p	+/– switchable 50mVp-p	+/– switchable 50mVp-p
Power Supply	AC50/60Hz, 100V, 120V, 220V, 240V, 33VA		
	[40VA]	[35VA]	[35VA]
Size and Weight	230mm(W) x 270mm(H) x 400mm(D), approx. 10kg		
Accessories	BNC ~ clip cable . . . 2 [Miniplug for remote control . . . 1]		

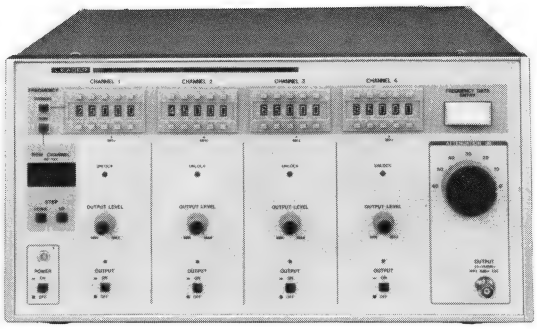
Signal Generator

VHF/UHF 4CH. SIGNAL GENERATORS

LSG-222A



LSG-222A-01



25~950MHz AM/Video Modulation Function

25~950MHz ROM 128CH, Remote Control

The LSG-222A and LSG-222A-01 are frequency-synthesizing signal generators which deliver mixtures of four different wave outputs, covering a range from the VHF to the UHF band.
Digital switches permit discrete frequency settings for the four waves, allowing these instruments to be used as external marker signal sources for sweep generators or simple signal sources for various types of measurement.
Because the LSG-222A has an amplitude modulation function, it is useful for picture and sound checks on TV sets.
The LSG-222A-01 includes provision by which frequency settings can also be made by using ROM.

■ FEATURES

LSG-222A, 222A-01

- Four synthesizer-oscillators are built in, and their output signals are mixed to provide one output.
- The instrument's output can be turned on and off discretely for the four waves.
- Frequency settings can be made across a wide band of 25~950 MHz at 10 kHz pitches by using digital switches.
- Frequencies can be set discretely for the four waves.

LSG-222A

- A simple amplitude modulation function (external, DC-10 MHz) is provided, making the instrument versatile.
- A simple video modulation (double side-band modulation) function is provided, allowing the instrument to be used in combination with a pattern generator and a signal generator which has a frequency modulation function for picture and sound checks on TV sets.
- Input terminals for accepting modulation signals are provided for all four waves, permitting modulation to be switched on and off discretely for the different waves. So channels can be easily separated from one another by using different modulation signals for the four waves.

LSG-222A-01

- Frequency settings can be made also by using ROM. This gives a choice of 128 combinations. The selection of channels can be changed over between step switches and remote control.

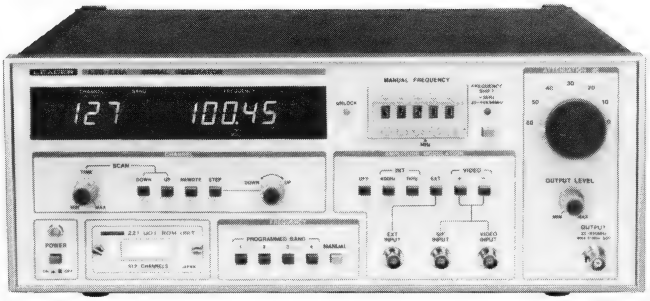
■ SPECIFICATIONS

Frequency	
Frequency Range	25 ~ 950MHz
Frequency Preset Resolution	10kHz
Frequency Accuracy	Within 0.01%+10kHz. . less than 100MHz 20kHz . . . . . more than 100MHz
Residual FM	Within 10kHz
Frequency Setting	Five-digit digital switches LSG-222A-01 only . . . . . ROM 128 channel control A) Step up-and-down touch switches (which can also be remote controlled) B) Remote seven-bit binary code
Output	
Output Voltage	LSG-222A: 0.1Vrms, 75Ω terminated LSG-222A-01: 0dBm, 50Ω terminated
Output Impedance	LSG-222A: 75Ω LSG-222A-01: 50Ω
Output Deviation	Within ±2dB
Attenuator	0 ~ 60dB, 10dB steps, rotary type (simultaneous for the four waves) 0 ~ 10dB, stepless variation, electronic type (discrete, for the four waves)
Spurious	Less than −40dBc
Harmonic	Less than −40dBc < 450MHz Less than −20dBc ≧ 450MHz
Modulation (LSG-222A only)	
External Amplitude Modulation	1 Normal DC ~ 10MHz 2 Video 10Hz ~ 10MHz, with synchronizing signal clamping and modulation polarity change-over 3 Sound 10Hz ~ 10MHz
Input Impedance	75Ω, HIGH (approx. 10kΩ) with exchange switch
Power Supply	AC100, 117, 220, 240V 50/60Hz LSG-222A approx. 90W LSG-222A-01 approx. 80W
Environmental Conditions	Operating ambient temperature: 5°C ~ 40°C Operating ambient humidity: below 85%
Size and Weight	400(W) x 198(H) x 450(D) mm, approx. 17 kg
Accessories	LSG-222A NC ~ BNC cable (75Ω), 1m long . . . . . 1 LSG-222A-01 BNC ~ BNC cable (50Ω), 1m long . . . . . 1 3P power cord ... 1, 3P-2P conversion adaptor ... 1, Time lag fuse ... 1, 1 Multi-pin plug 36-P ... 1(LSG-222A-01 only)

Signal Generator

VHF/UHF SIGNAL GENERATOR

LSG-221A



25~950MHz, 512CH for 4 bands

The LSG-221A is a signal generator of the synthesizer which covers the bands from VHF to UHF.
As frequency setting is possible using the ROM or digital switches and the AM and Video modulation function is provided, the instrument can be used as an external marker signal source of a sweep generator as well as an easy-to-use signal source for various measurements.

■ FEATURES

- Wide range of frequency band coverage, 25 to 950 MHz, in a 10-kHz step.
- Frequency setting by digital switches, ROM and remote control (using digital switches external and CPU) for proper selection depending on application purposes.
- Simplified AM modulation function (internal 400 Hz and 1kHz in 30% modulation duty; external DC to 10 MHz) to broaden application areas.
- Built-in video modulation function (non-calibrated, double-side-band modulation) enables checking of audio & video signals in all channels of VHF, UHF, CATV for TV receiver, in combination with pattern generator and signal generator featuring frequency modulation function.
- A large capacity of the ROM to accommodate 512 channels. The stored information is divided into 4 band groups; thus, selection of step switch, auto scan and remote control is possible.

The most suitable signal source for measuring video equipment

★Highly-accurate PLL synthesizer system.
★Frequency can be set in 10kHz steps (for a wide range of frequency band coverage) and 5kHz steps (for 25 ~449.99MHz).
★ROM can accomodate a frequency for 512 channels (128 channels × 4 bands.).
★Channel selection is available in the Auto Scan, Step Switch, and Remote Control modes.
★Built-in AM and Video modulation functions.

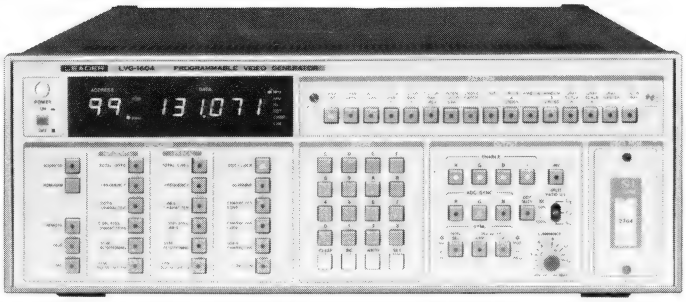
■ SPECIFICATIONS

Frequency	
Frequency Range	25MHz ~ 950MHz
Frequency Preset Resolution	10kHz (However, 5kHz for a range of 25 ~ 449.99MHz using the +5kHz switch)
Frequency Accuracy	Within 0.01% +10kHz for ≦100MHz, and 20kHz for >100MHz
Residual FM	Within 10kHz
Frequency Setting	1 5 digits digital switch 2 ROM (Total 512CH for 4 bands as 128CH available for a single band) (But, if frequency is not specified blank ROM will be shipped out.) 3 Remote Control (TTL level)
Display	6 digits, 7 segments LED
Output	
Output Voltage	0dBm with 50Ωload, no modulation, and −15dBm approx. with 50Ω load, modulation
Output Impedance	50Ω
Output Deviation	Within ±2dB
Attenuator	0 ~ 60dB, 10dB step rotary type, 0 ~ 10dB, continuously variable electronic type
Spurious	Less than −30dBc
Harmonics	Less than −30dBc (unmodulated) Less than −20dBc (2nd harmonic, with modulation) Less than −10dBc (3rd harmonic, with modulation)
Modulation	
Internal Modulation	400Hz and 1kHz, 30% modulation rate
External Modulation	1 DC ~ 10MHz, 30% modulation approx. 50mVrms 2 VIDEO (10Hz ~ 10MHz) with sync. signal clamp and modulation polarity switching 3 Sound 10Hz ~ 10MHz
Others	
Channel Control by ROM	1 Auto scan time: 0.1 ~ 10sec. variable per channel 2 Step: 12 step pulse switch, up down automatic selection 3 Remote: 7 bits, binary code
Remote Control	1 Frequency preset 2 ROM band and channel control
Environmental Condition	Operating ambient temperature: 5°C ~ 40°C Operating ambient relative humidity: below 85%
Power Supply	AC 100, 120, 220, 240V 50/60Hz, approx. 20W
Size and Weight	400(W)x148(H)x300(D)mm, approx. 7.5kg
Accessories	BNC ~ BNC cable (50Ω 1m) . . . . . 1 3-P power cord . . . . . 1 3-P ~ 2-P conversion adapter . . . . . 1 Time lag fuse . . . . . 1 Multi-pin plug (for remote connection) 36-P 1

For CRT Display

PROGRAMMABLE VIDEO GENERATORS

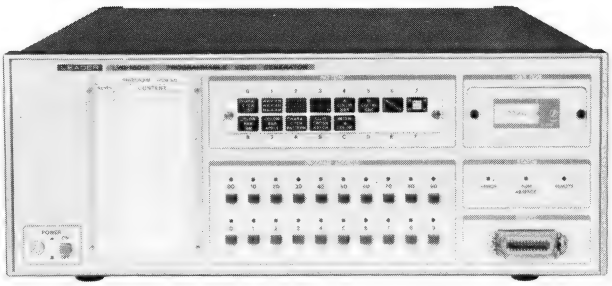
LVG-1604



NEW

Clock Frequency
1.024~131.072MHz

LVG-1601A



Clock Frequency
4.096~50.000MHz

For Adjustment, Testing and Evaluation of Color Graphic Display with High Resolution.

LVG-1604/LVG-1601A

The LVG-1604 and the LVG-1601A are programmable video generator of wide band and general purpose, which are designed to generate arbitrarily with program sync and video signals of CRT display equipment with raster scan device. This enables adjustment, testing and demonstration of such equipments as video monitors, computer terminal display, color graphic displays with high resolution, etc.
This generator consists of micro-computer controlled controller section, wide band clock frequency synthesizer, programmable CRT controller and analog/TTL/ECL level output circuitry which meet almost all kinds of CRT display equipments. The clock frequency covers up to 131MHz (LVG-1604) of dot clock. Sync timing to horizontal direction can be set by dot unit and one to vertical direction set by line (scan) unit.

■ FEATURES

- Dot clock frequency can be set, by means of built-in frequency synthesizer, at a range from 1.024MHz to 131.072MHz (1604), 4.096MHz to 50.000MHz (1601A).
- External clock can be applied, and built-in clock has its output terminal.

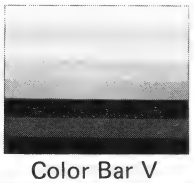
LVG-1601-02

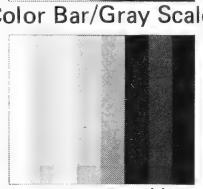
The LVG-1601-02 Video Generator Programmer is able to form programs for use on the LVG-1601A Programmable Video Generator. It is also capable of remote controlling LVG-1601A.

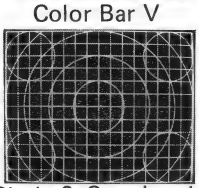
- By connecting to LVG-1601A programming can be carried out while simultaneously operating under remote control.
- It is equipped with the standard RS232C Serial I/O interface, enabling transfer of the programs to be made to the ROM writer, personal computer or other device.
- The dialogic operation through program display on a large LCD screen facilitates program editing.

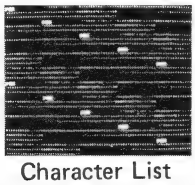
LVG-1604 Patterns

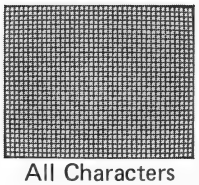

Color Bar/Gray Scale


Color Bar V

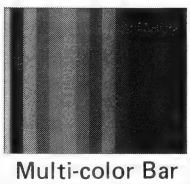

Color Bar H


Circle & Crosshatch

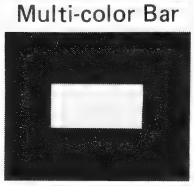

Character List

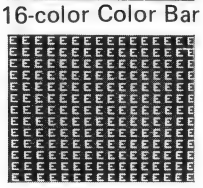

All Characters

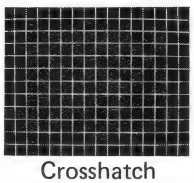
LVG-1601A/1601-02 Patterns

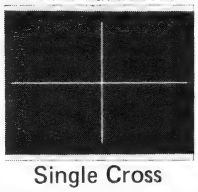

Multi-color Bar


16-color Color Bar


Window


All Characters


Crosshatch

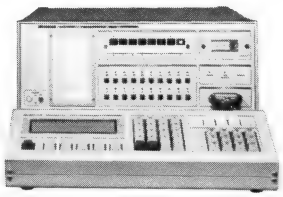

Single Cross

For CRT Display

■LVG-1601-02 VIDEO GENERATOR'S PROGRAMMER

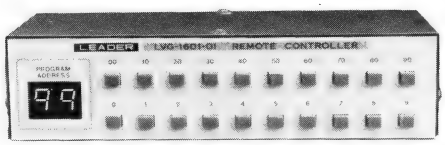
★Diagram

LVG-1601A



LVG-1601-02

■LVG-1601-01 Remote Controller



The LVG-1601-01 is the remote controller used to control the LVG-1601 programmable generator.

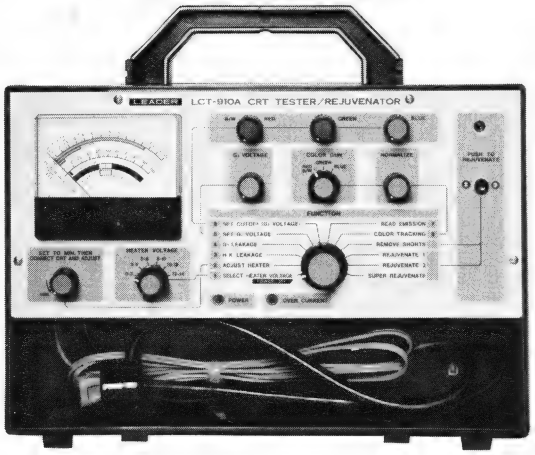
■ SPECIFICATIONS

MODEL	LVG-1604	LVG-1601A
PROGRAMMABLE		
Clock Frequency		
Frequency Range	1.024~131.072MHz	4.096~50.000MHz
Setting Resolution	1.024~131.072MHz in 1kHz step	4.096~16.384MHz in 1kHz step 16.384~32.768MHz in 2kHz step 32.768~50.000MHz in 4kHz step
Internal Clock Output	1.024~131.072MHz (ECL level)	4.096~50.000MHz (TTL level)
External Clock Input	none	4.096~50.000MHz (TTL level)
Horizontal Conditions		
Total Dots	64~4096 dots	———
Frequency	1.024~131.072kHz, 1Hz step	———
Dots/Character	4~16 dots, 1 dot step	4~32 dots, 1 dot step
Displayed Characters	2~255 characters, 1 character step	2~254 characters, 2 character step
Sync Positioning	1~4096 dots, 1 dot step	———
Sync Pulse Width	1~4095 dots, 1 dot step	Non-interlace: 2~32 characters, 1 character step Interlace, Interlace Shrink: 3~32 characters, 1 character step
Front Porch	———	0~64 characters, 1 character step With 2 or more front porches: 3~64 characters, 1 character step
Back Porch	———	With 1 front porches: 4~64 characters, 1 character step With 1 front porches: 5~64 characters, 1 character step
Vertical Conditions		
Total Lines	10~4096 lines, 1 line step	———
Frequency	1.024~131.072Hz, 0.001Hz step	———
Lines/Character	1~64 lines, 1 line step	1~32 lines, 1 line step
Displayed Lines	2~4095 lines, 1 line step	1~1024 lines, 1 line step
Sync Positioning	1~4096 lines, 1 line step	———
Sync Pulse Width	1~4095 lines, 1 line step	1~31 lines, 1 line step
Front Porch	———	1~63 lines, 1 line step
Back Porch	———	1~63 lines, 1 line step
Selection of Interlace	Non-interlace, Interlace, Interlace Shrink (Sync & Video)	
Output Setting		
Sync Signal Polarity	Set at either positive or negative polarity	
Composite Sync Signal	H or V sync output can be set either or composite sync of H & V	
Composite Video Signal	Set to select whether composite sync signal is added to analog video signal or not	
Dot Duty	Horizontal display time of dots can be set at 50% (RZ signal) or 100% (NRZ signal). Analog video signal has 100% only.	Horizontal display time of dots can be set at 50% (RZ signal) or 100% (NRZ signal).
Selection of Characters		
Character Font	Convertible between 5 x 7 dots & 7 x 9 dots	
Character Set	Selection display of a alphabetical character (capital/small), symbol, numeric character and Katakana per JIS code	
Character Font Defined by Users	Up to 16 kinds (the maximum size of 32 x 32 dots) can be set.	Up to 32 kinds (the maximum size of 32 x 32 dots) can be set.
Selection of Patterns	Character list, total characters, character patterns, color bars, crosshatch, dot, circle, window, gray scale etc. 16 kinds of patterns out of 31 ones can be selected and displayed.	Character list, Total characters, Crosshatch, Single cross, Color bar of eight colors, Color bar of multiple colors, Gray scale, Focus window, Intensity color bar.
Memory Selection	Program address 0~99 (100 address) ROM or RAM Program back-up memory capacity 8K bytes	Program address 0~99 (100 address) ROM only
OUTPUT SIGNAL		
Analog Output		
Video Output	R(red), G(green), B(blue), 3 outputs (impedance 75Ω)	
Output Level	Max. 1Vp-p (75Ω) level variable. Dot clock frequency is up to 125MHz.	0.5~1.5Vp-p (75Ω) level variable. Dot clock frequency is up to 50MHz.
Composite Sync Signal Added	ON/OFF possible at each output of R, G, B	
HS/HVS Output	Selection between the horizontal sync signal output in the range from TTL level (2Vp-p) to 0.5Vp-p with level adjustor and horizontal/vertical composite sync signal output.	
VS Output	Vertical sync signal output in the range from TTL (2Vp-p) to 0.5Vp-p with level adjustor.	
Analog Output (15P Connector)	———	Connected in parallel with BNC connector output.
TTL Output (24P Connector)	Video Output: R(red), G(green), B(blue), I(intensity) 4 outputs, Sync Output: HS/HVS, VS 2 outputs	
ECL Output (25P Connector)		———
Video Output	R, $\overline{R}$, G, $\overline{G}$, B, $\overline{B}$, I, $\overline{I}$	
Sync Output	HS/HVS, $\overline{HS/HVS}$, VS, $\overline{VS}$	
Clock Output	CLK, $\overline{CLK}$	
Power Supply	AC100, 120, 220, 240V, 50/60Hz, 250VA	AC100, 120, 220, 240, 50/60Hz, 100VA
Size	426(W) x 150(H) x 450(D)mm	400(W) x 150(H) x 450(D)mm

CRT Checker

CRT TESTER/REJUVENATOR

LCT-910A



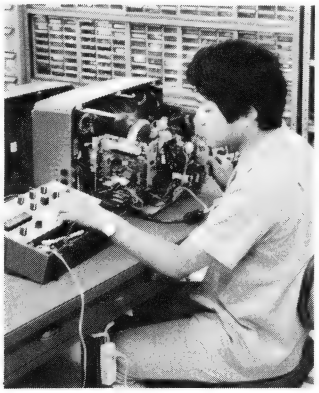
Judging Good/Bad for CRT

This instrument has been designed for rapid and simple tests on the condition of a color or B/W CRT. In addition, provision has been included for activation and rejuvenation of a tube with low emission. It features controls and meter scales which are numbered and color-coded for ease in operation, which makes the LCT-910A an invaluable tester for use in the field and in service shops.

In use, the following tests can be applied:

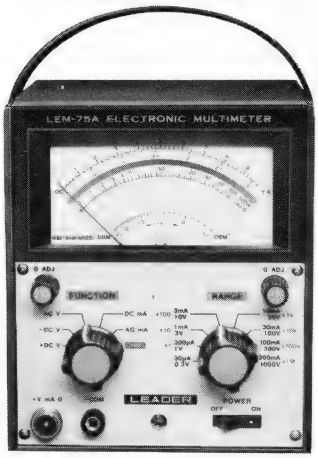
* Checking shorts and leakages between heater and cathode, and cathode and G1.
* Checking cathode emission characteristics.
* Separately checking condition of the three guns in a color tube and to track the emission.
* Removal of shorts or leakage between elements in a tube.
* Activation of low emission cathodes.
* Rejuvenation of a low emission cathode with use of automatic timing; super-rejuvenation with manual control.
* Checking of heater warm-up characteristics.
* Simplified life testing.

Power Supply	AC100, 120, 220, 240V, 50/60Hz: 20VA approx.
Size and Weight	215(W) x 325(H) x 125(D)mm 3.5kg approx.
Accessories	3 sets of socket



ELECTRONIC MULTIMETER

LEM-75A



DC–V/mA, AC–V/mA, Ω

The LEM-75A is a sensitive volt-current meter for DC and AC measurements. It features high input resistance, wide scales with mirror-backing. FET's are used for high reliability in the stable DC amplifier. Voltages down to 0.01V and currents as low as 0.001mA (1μA) can be measured for DC and AC inputs.

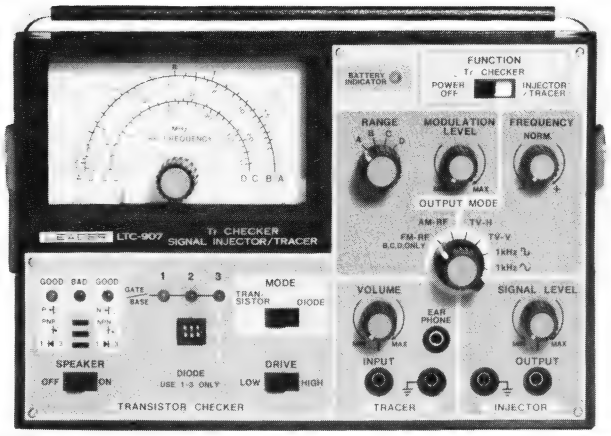
■ SPECIFICATIONS

DC Voltage	
Range	0.3 ~ 1000V, full scale, positive or negative, in 8 ranges
Accuracy	±3% of full scale.
Input Resistance	10MΩ
AC Voltage	
Range	0.3 ~ 1000Vrms, full scale in 8 ranges
Accuracy	±4% of full scale
Input Resistance	10MΩ
Frequency Range	25Hz ~ 1MHz at 0.3V range: ±0.5dB 20Hz ~ 3MHz at 1 ~ 1000V ranges: ±1dB
dB Calibration	−15 ~ +2 dBm (0dB = 1mW/600Ω)
Peak-to-peak Volts	0.1 ~ 2800Vp-p: 8 ranges
DC Current	
Range	0.03 ~ 300mA, full scale, in 8 ranges
Accuracy	±3% of full scale
Internal Drop	0.3V at full scale
AC Current	
Range	0.03 ~ 300mA, full scale, in 8 ranges
Accuracy	±4% of full scale
Internal Drop	0.3V at full scale
Frequency Range	40 ~ 400Hz
Resistance — OHMS	
Range	0.2Ω ~ 500MΩ in ranges; 10, 100, 1k, 10k, 100k, 1M and 10M ohms at mid-scale
Accuracy	Within 3% of scale length
Power Supply	AC100, 120, 220, 240V, 50/60Hz
Battery	"C" cell (1.5V, NEDA 14, or equiv) 1
Size and Weight	150(W) x 175(H) x 125(D)mm: 3 kg
Accessories	Test prod 1

Transistor Checker

Tr CHECKER SIGNAL-INJECTOR/TRACER

LTC-907



AM-IF/RF, SW/FM, FM-IF,TV-V/H, 1kHz

The LTC-907 is a measuring instrument designed for servicing radios and TV receivers and consists of Transistor Checker, Signal Injector and Signal Tracer.

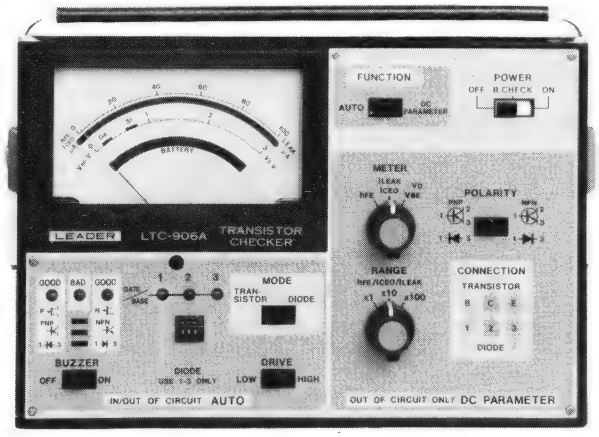
- It automatically determines whether or not the transistors, FET's and diodes in the circuits are acceptable, and identifies the electrode and types (P/N).
- A variety of output signals are available:
  AM-IF, AM-BC, AM/FM-SW, FM-IF, FM/AM-RF are covered by 4 bands.
- Audio & RF (employing the detection probe) signal tracer.

■ SPECIFICATIONS

Transistor Checker Section	
Semiconductors to be tested	Bipolar transistor, J-FET, MOS-FET, diode, etc.
Items of Judgment Good/Bad	In-circuit, Out-of-circuit Reference Transistor, FET: Whether or not their amplification is as provided. Diode: Whether or not their rectification is as prescribed.
Polarity	Transistor: PNP/NPN, FET: P/Nchannel Polarity of diode (anode/cathode)
Electrode Indication of Judgment	Transistor base; FET gate Light emitting diode; Speaker sounding
Signal Injector Section	
RF Output FM-RF Mode Frequency Deviation	B, C, D bands Mod. freq. is 1kHz. B band 0 ~ 5kHz, C band 0 ~ 25kHz, D band 0 ~ 50kHz and more continuously variable
AM-RF Mode Modulation	A, B, C, D bands Mod. freq. is 1kHz. 0 ~ 40% and more continuously variable
Frequency Bands	A 0.455 ~ 1.8MHz AM — B 3.5 ~ 14MHz AM · FM C 38 ~ 64MHz AM · FM D 64 ~ 110MHz AM · FM
Output Voltage	Max. 5mVrms or more, open circuit
TV Audio Output	TV-H; 15.75kHz Rectangular wave TV-V; 55Hz Rectangular wave 1kHz; Sine/Rectangular wave
Signal Tracer Section	
Input Frequency Range Contained Speaker External Earphone	0.4 ~ 4kHz 1 ~ 4kHz 8Ω, 0.4 ~ 4kHz
Internal Battery External Power Supply	006P (9V) battery (1 unit) DC 8 ~ 10V 25mA
Size and Weight	210(W) x 140(H) x 75(D)mm, 1.1kg
Accessories	Test lead for the transistor checker, pair plug-banana cable, detection/direct probe, earphone

TRANSISTOR CHECKER

LTC-906A



Automatically Checks and Identifies

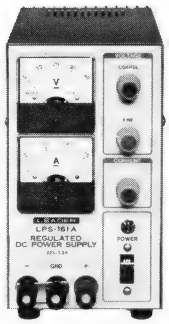
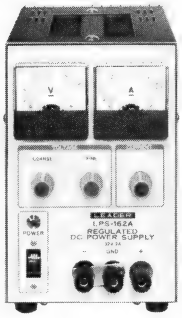
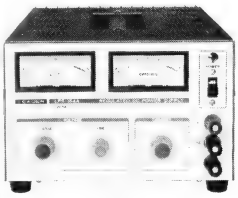
The LTC-906A is a transistor tester which is capable of determining good/bad of transistor, FET, UJT, diode, etc. and also performing automatic determination of the base or gate leads in-circuit and out-of-circuit. This tester is also capable of DC parameter measuring transistor and diode out-of-circuit.

■ SPECIFICATIONS

AUTOMATIC MODE Item of Test	GOOD/BAD Polarity (PNP/NPN, P channel/N channel) Base of transistor, Gate of FET Cathode/Anode of diode
Measurement Mode Test Voltage Test Current	Transistor and diode ± 2V, 10% duty cycle 4.5 mA in LOW drive 60 mA max. in HIGH drive (short term)
Scanning Rate	0.1 sec per test, complete scan in 1 second
Display	Light emitting diodes and sound by buzzer
DC PARAMETER MODE V_{BE} and V_D	0 ~ 3VDC 1 range, accuracy ±6% F.S. Measuring current; Max. 2mA
I_{CEO} and I_{LEAK}	0 ~ 100, 0 ~ 1,000 and 0 ~ 10,000μA in 3 ranges, accuracy ± 6% F.S. Test voltage ± 5 V max.
h_{FE}	0 ~ 100, 0 ~ 1,000, 0 ~ 10,000, 3 ranges Base current 1μA Collector current 30 mA maximum
Power Supply Internal Battery	Standard 9V transistor radio battery (EVEREADY 216, MALLORY MN1604)
External	DC 8 ~ 10V, 25 mA
Size and Weight	210(W) x 140(H) x 75(D)mm (excluding handle) approx. 1.1kg
Accessory Options	3-lead test cable . . . . . 1 AC adaptor LPS-169A DC9V, 25 mA In-circuit probe LP-11Y

Regulated Power Supply

REGULATED DC POWER SUPPLIES

LPS-160A	LPS-161A	LPS-162A	LPS-163A	LPS-164A
				
32V / 0.5A	32V / 1.2A	32V / 2A	32V / 3A	32V / 5A

LPS-160A to 164A, 32V series are regulated DC power supply units with voltmeter and amperemeter; the LPS-160A can supply the DC power of 0 to 32V, 0.5A; the LPS-161A 0 to 32V, 1.2A; the LPS-162A 0 to 32V, 2A; the LPS-163A 0 to 32V, 3A; and the LPS-164A 0 to 32V, 5A. They are provided with continuously variable coarse adjustment and fine adjustment of the output voltages, and with continuously variable current adjustment in a range of 10 to 100%.

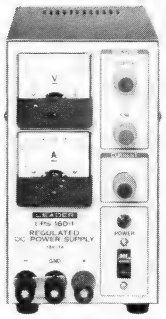
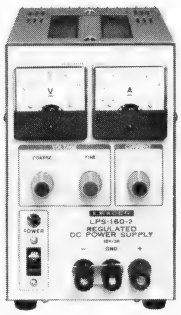
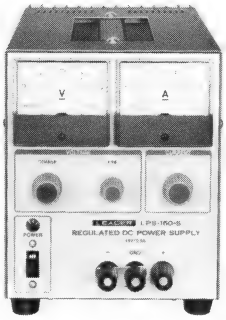
- Built-in output current limiter circuit.
- Availability of series and/or parallel operation.

■ SPECIFICATIONS

MODEL	LPS-160A	LPS-161A	LPS-162A	LPS-163A	LPS-164A
Output voltage	0 ~ 32V Continuously variable				
Output polarity	Positive and negative				
Output current	0 ~ 0.5A	0 ~ 1.2A	0 ~ 2A	0 ~ 3A	0 ~ 5A
Ripple voltage	Less than 3mVp-p				
Output stability	Less than 5mV for power source voltage change of ±10% Less than 5mV for load variation of 0 to 100%				
Voltmeter	40V (F.S) Accuracy of 2.5% for full scale				
Amperemeter	0.6A (F.S) Accuracy of 2.5% for full scale	1.5A (F.S) Accuracy of 2.5% for full scale	2.5A (F.S) Accuracy of 2.5% for full scale	4A (F.S) Accuracy of 2.5% for full scale	6A (F.S) Accuracy of 2.5% for full scale
Insulation	Between chassis and output terminal: More than 10MΩ at DC 500V Between chassis and AC plug: More than 50MΩ at DC 500V				
Compensation/protection circuit	Overload protection circuit of constant current self-restoring type				
Ambient temperature range	0 ~ +40°C				
Power Source	AC100/120/200/240V 50/60Hz 47VA	AC100/120/200/240V 50/60Hz 93VA	AC100/120/200/240V 50/60Hz 153VA	AC100/120/200 240V 50/60Hz 220VA	AC100/120/200/240V 50/60Hz 340VA
Size and weight	175(H) x 100(W) x 195(D) mm 3.5kg		175(H) x 115 (W) x 225(D) mm 7kg	175(H) x 150(W) x 300(D) mm 8kg	146(H) x 216(W) x 287(D)mm 9kg
Accessories	Short-circuit bar . . . . 1 Fuse 1				
Operation	Series and parallel				

Regulated Power Supply

REGULATED DC POWER SUPPLIES

LPS-160-1	LPS-160-2	LPS-160-3	LPS-160-4	LPS-160-5
				
18V / 1A	18V / 2A	18V / 3A	18V / 4.5A	18V / 5.5A

LPS-160-1 to 160-5, 18V series are regulated DC power supply unit with a voltmeter and amperemeter; the LPS-160-1 can supply the DC power of 0 to 18V, 1A; the LPS-160-2 0 to 18V, 2A; the LPS-160-3 0 to 18V, 3A; the LPS-160-4 0 to 18V, 4.5A; the LPS-160-5 0 to 18V, 5.5A. They are provided with continuously variable coarse adjustment and fine adjustment of the output voltages, and with continuously variable current adjustment in a range of 10 to 100%.

- Built-in output current limiter circuit.
- Availability of series and/or parallel operation.

■ SPECIFICATIONS

MODEL	LPS-160-1	LPS-160-2	LPS-160-3	LPS-160-4	LPS-160-5
Output Voltage	0 ~ 18 V Continuously variable				
Output Polarity	Positive and negative				
Output Current	0 ~ 1 A	0 ~ 2 A	0 ~ 3 A	0 ~ 4.5 A	0 ~ 5.5 A
Ripple Voltage	Less than 3mVp-p				
Output Stability	Less than 5mV for power source voltage change of ±10% Less than 5mV for load variation of 0 to 100%				
Voltmeter	20V (F.S) Accuracy of 2.5% for full scale				
Amperemeter	1.2A (F.S) Accuracy of 2.5% for full scale	2.5A (F.S) Accuracy of 2.5% for full scale	4A (F.S) Accuracy of 2.5% for full scale	5.4A (F.S) Accuracy of 2.5% for full scale	6.4A (F.S) Accuracy of 2.5% for full scale
Insulation	Between chassis and output terminal: More than 10MΩ at DC 500V Between chassis and AC plug: More than 50MΩ at DC 500V				
Compensation/ Protection Circuit	Overload protection circuit of constant current self-restoring type				
Ambient Temperature Range	0 ~ +40°C				
Power Source	AC100/120/200/240V 50/60Hz 42VA	AC100/120/200/240V 50/60Hz 90VA	AC100/120/200/240V 50/60Hz 170VA	AC100/120/200/240V 50/60Hz 230VA	AC100/120/200/240V 50/60Hz 265VA
Size and Weight	175(H) x 100(W) x 195(D) mm 3.5kg		175(H) x 115(W) x 225(D) mm 7kg	175(H) x 150(W) x 300(D) mm 7.5kg	
Accessories	Short-circuit bar . . . . 1 Fuse 1				
Operation	Series and parallel				

Regulated Power Supply

DC TRACKING POWER SUPPLIES

LPS-151

0~6V(3A), 0~±25V(0.5A)

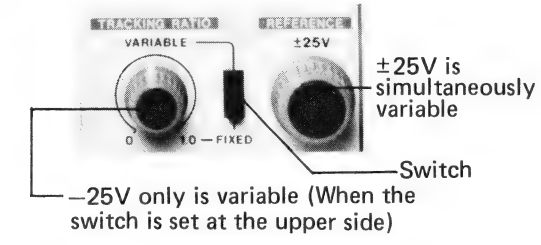
LPS-152

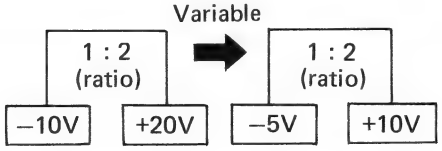
0~6V(5A), 0~±25V(1A)

Capable of Simultaneously Supplying 3 Kinds of Powers and Independently Setting Voltage and Current

3 kinds of stabilized DC powers, 0 ~ +6V, 0 ~ +25V and 0 ~ −25V, can be taken out of the LPS-151/152. No large space is necessary as the body is in half-rack size. ±25V output can be used as tracking voltages, and + and − voltages can be changed simultaneously by a single knob. Further, when + power used as a reference, − power is set at the same potential or below, voltage can be changed at the same ratio and therefore, this power supply is convenient for testing and adjustment of a microcomputer or operational amplification circuit.

■ **Tracking setting of +25V, −25V is possible.**





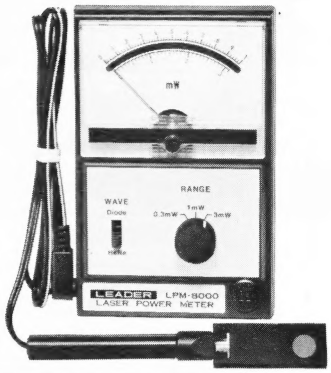
■ **SPECIFICATIONS** [Figures in brackets are for LPS-152]

Output voltage/range and polarity	0–6V (positive)	0–25V (positive)	0–25V (negative)
Output current range	0–3A[5A]	0–0.5A[1A]	0–0.5A[1A]
Ripple voltage	Less than 3mVp-p		
Line regulation (output stability)	At ±10% change in line voltage, less than 3mV plus 0.01% of input change.		
Load regulation	From zero to full load, less than 3mV plus 0.01% of the load value.		
Tracking voltage	For tracking ratio mode, the voltage ratio being less than 1.5%.		
Voltmeter scale	Common 0 through 7 to 30V scale, (both polarities) for indication of the switch selected range.		
Ammeter	Common 0 through 0.6 to 3.5A [0 through 1.2 to 6A], both polarities, for indication of the selected switching range. Synchronized with a voltmeter indication choice by the selector switch.		
Accuracy	5% of the full scale.		
Insulation voltage	AC 1500V for one minute between the AC input and case.		
Circuit protection	Overload protection circuit with automatic resetting by sensing a constant current.		
Heat sink temperature	Room temperature (23 to 25°C), or 85°C at full load.		
Preservation temperature	−20 to +70°C		
Operating humidity range	30 to 85%		
Operating temperature range	0 to 35°C		
Power supply	AC 100V, 120V, 200V, 220V, 240V		
Power consumption	Approx. 150VA [approx. 250VA]		
Size (WxHxD) and weight	215 x 132 x 332mm, approx. 6.1kg [215 x 132 x 360mm, approx. 7.5kg]		

Meter/Checker/Probe

LASER POWER METER

LPM-8000



The LPM-8000 is a simplified laser power meter. Receiving laser beams with its sensor, the instrument indicates measured values on the meter. Measuring range for wavelength can be selected between two ranges, 632.8nm (633nm) and 750nm–820nm, and the measuring range for power voltage can be selected in a range from 0.3mW to 3mW.

The measuring level of 633nm is available for the measurement of helium-neon ray apparatus; while, the measuring range of 750nm–820nm, for the measurement done for digital audio disc players.

■ SPECIFICATIONS

Measuring Range for Wavelength	632.8nm (633nm) or 750nm ~ 820nm, 2 ranges
Measuring Range for Power Voltage	0.3mW ~ 3mW
Power Range	Converted among 0.3mW, 1mW, and 3mW
Measuring Accuracy	±5% or less of whole measuring scale (when joined to sensor)
Sensor Section	Light-catcher area: 10mm ϕ (Allowable dissipation of silicon photodiode: 200mV)
Main Body Size	90(W) x 31(H) x 140(D) mm
Sensor Section Size	18(W) x 4(H) x 40(D) mm, movable with an 80cm cable
Indicator Section	Coil-type meter with a moving needle

VTR HEAD CHECKER

LHC-909B/V

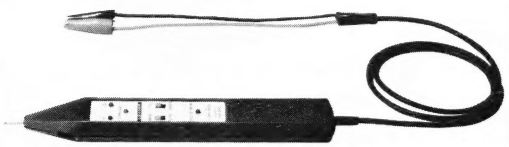
This is a video head checker used for determining whether a video head is in good condition by detecting the wear state of the video head and indicating it on a meter. As the type of video head differs depending upon model of video tape recorder or system employed, make a judgement on measured value according to the judging table. The specifications of this video head checker are outlined below. The LHC-909B is a cheker for the Beta system VTR, while the LHC-909V is a checker for the VHS system VTR. Select the model applicable to the VTR system you are checking.

	Model 909B (Beta)		Model 909V (VHS)	
	Measuring Range	Nominal Inductance of 0 Point	Measuring Range	Nominal Inductance of 0 Point
Range A	approx. 0.8 to 3.4 μH	1.5 μH	approx. 0.4 to 3.5 μH	0.9 μH
Range B	approx. 0.6 to 2.8 μH	1.2 μH	approx. 0.8 to 3.0 μH	1.4 μH
Range C	approx. 0.42 x 2.2 μH	0.95 μH	approx. 0.5 to 1.5 μH	0.85 μH

• Measuring Frequency: approx. 1 MHz • Measuring System: Simplified bridge measuring circuit. • Working Voltage: DC 9V (use a 6F22 or S-006 battery) • Working Time: Continous approx. 8 Hrs. • Size: 90(W) x 31(H) x 140(D)mm

DIGITAL LOGIC PROBE

LDP-076



Fast servicing and analysis of digital circuits.

The LDP-076 is a Digital Logic Probe which has been specially designed to quickly and easily analyze the logic circuits such as TTL, DTL, and CMOS.

■ SPECIFICATIONS

Input Impedance: More than 10MΩ
Frequency Range: DC to 50MHz
Minimum Detectable Pulse Width: 10nsec (20nsec for CMOS)
Audible Warning: Built-in buzzer emits alarm when an input signal exceeds the V_{DD} of the circuit being tested or when a voltage higher than 30V DC is applied to power input or when power lead is connected reversely or with AC line.
Size and Weight: 195(L) x 26(W) x 16(H)mm, 70g
Accessories: Ground lead, IC-clip lead, deluxe molded plastic carrying case.

HIGH VOLTAGE METER PROBE

LHM-80A

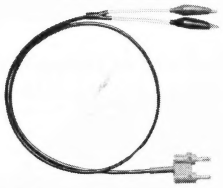
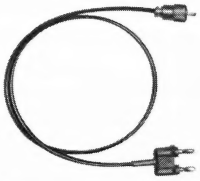
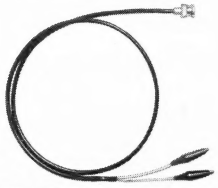
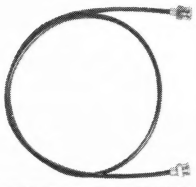
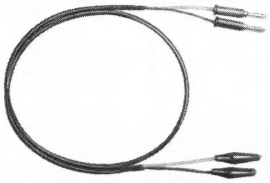
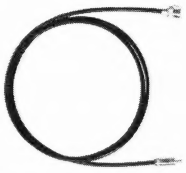
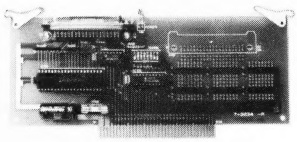
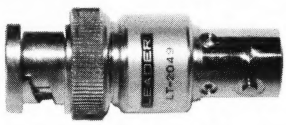
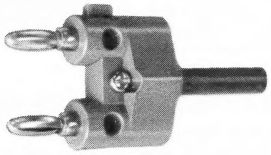
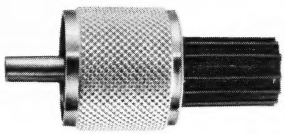
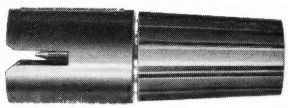
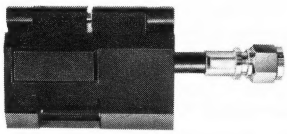
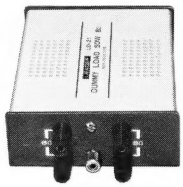
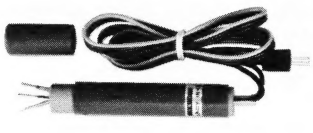
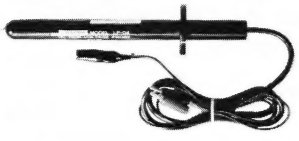
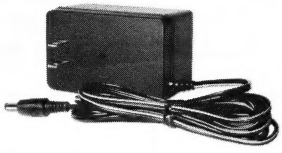
For Color and B & W TV checking, 0 ~ 40kV

Light weight, easy-to-grip high-impact plastic handle with arc-over protection and no need of extra equipment. An indispensable item in your TV service kit. Measures up to 40,000 V DC with safety and greatest of ease. Entirely self-contained. Connect the lead clip to chassis and probe tip to the check point – read the meter for voltage.

■ SPECIFICATIONS

Input Impedance: 20KΩ per volt (50μA movement)
Range: 40K volts
Accuracy: ±3%, full scale
Multiplier Resistance: 800 megohms
Material: High impact polystyrene
Length & Weight: 385mm, 300g approx.

Optional Accessories

PAIR-PLUG～CLIP	PAIR-PLUG～PAIR-PLUG	PAIR-PLUG～PIN-PLUG	PAIR-PLUG～UHF
LC-2021 	LC-2022 	LC-2023 	LC-2025 
BNC～CLIP	**BNC～BNC**	**BANANA～CLIP**	**BNC～PIN-PLUG**
LC-2026 (75Ω) 	LC-2027 	LC-2028 	LC-2029 
PIN-PLUG～PIN-PLUG	**BNC～PAIR-PLUG**	**TRANSFER CABLE**	**PPI 8255 I/O CARD**
LC-2030 	LC-2043 	LC-2066 for LBO-5880 LC-2069 for LBO-5825 	LC-2330  for LBO-5825, 5880
BNC TERMINATORS	**PAIR—PLUG**	**TERMINAL ADAPTOR**	**TERMINAL ADAPTOR**
LT-2049 (50Ω) LT-1551 (75Ω) 	LJ-10 	UHF 	BNC 
COAXIAL CLIP	**BALUN**	**AC CLAMP PROBE**	**DUMMY LOAD**
LJ-09 	LBN-14 	LC-19 	LD-21 
For LFC-944, 945 Impedance: 75Ω Insertion Loss VHF: Less than ± 0.5dB UHF: Less than ± 1.0dB	For LFC-944, 945 300Ω – 75Ω Matching Pad. Insertion Loss VHF: 1dB approx. UHF: 2dB approx.	For LDM-853A Measurement Current Range: AC 0.1 ~ 200A Accuracy: ± 3% Measurement Freq. : 50/60Hz	For LAS-5500 100W for 4Ω parallel 50W for 16Ω series
IN-CIRCUIT PROBE	**DC HIGH VOLTAGE PROBE**	**AC ADAPTORS**	**CARRYING CASE**
LP-11Y 	LP-6 	LPS-1908, 169, 166 	LC-2200, 2211, 2214, 2221 
For LTC-906A, 907 Three-Point Probe permits convenient, one-handed connection to transistors installed on printed circuit boards.	For LDM-853A Input Resistance: 500MΩ±10% Range Multiplication: X100±10% Voltage Measurement: Max. 30kV ±10%	LPS-1908: DC8V for LDM-853A LPS-169: DC9V for LTC-906A, 907 LPS-166: DC6V for LDC-831, LCT-193D	LC-2200 for LFC-944 LC-2211 for LDM-853A, LDC-831 LC-2214 for LTC-906A, 907 LC-2221 for LBO-323, 324

Optional Accessories

Remote Controller

LSG-215-01

Band Splitting Filter

LF-5010-50

ROM UNIT

215-U01

Signal Selector

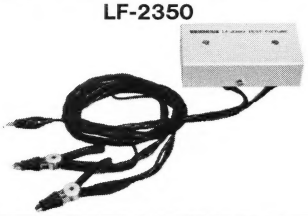
LSS-5011

Dummy Antenna

LDA-1554-50

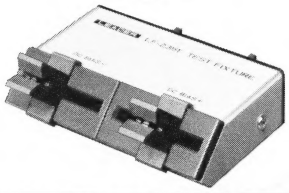
Test Fixture (kelvin's clip type)

LF-2350



Test Fixture (Inserting type)

LF-2351



PROBE (100MHz~15MHz) ※ Note: X……BNC type, Y……UHF type

Low Capacitance

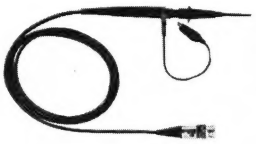
LP-100X

DC~100MHz(×1, ×10)

LP-060X

DC~60MHz(×1, ×10)

LP-16BX, 16BY



DC~40MHz (×1, ×10)

High Impedance

LP-17AX, 17AY

DC~40MHz(×10, ×100)

Demodulator

LP-7X, 7Y

DC~15MHz (×10)

FOR FREQUENCY RESPONSE RECORDERS (LFR-5600A, 5601, 5602)

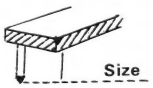
Recorder Pen

LC-2302-R-10

Type Name

Color: R for Red, B for Black, V for Violet

Size: 6.5mm, 10mm, 25mm



※ Supplied Accessories

- LFR-5600A····10mm (LC-2302-R-10, LC-2302-B-10)
- LFR-5601·····6.5mm (LC-2302-R-6.5, LC-2302-B-6.5)
- LFR-5602·····6.5mm / 25mm (LC-2302-B-6.5, LC-2302-R-25)

Chart Paper

Model	Width	Length	Application
LC-056	50mm	60m	Freq. Response Recording
LC-057	50mm	60m	DC Recording
LC-058*	50mm	60m	Admittance Recording
LC-059*	50mm	60m	Impedance Recording
LC-066	100mm	60m	Freq. Response Recording
LC-067	100mm	60m	DC Recording

*Combination with LSP-5621A

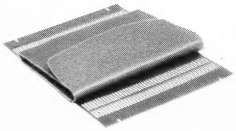
Test Record

Measurement For Phono Cartridge

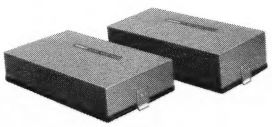
QR-2009 : 20Hz~20kHz
QR-2010 : 20Hz~45kHz
} Brüel & Kjaer

ACCESSORY POUCH, FRONT-PANEL COVER, HOOD

Accessory Pouch



Front-Panel Cover

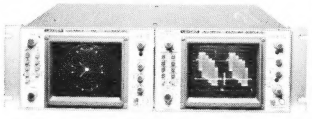


Hood

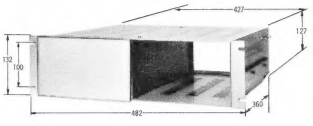
DESCRIPTION / MODEL	LP-2004A	LP-2013	LP-2017	LC-2014	LC-2016	LC-2131	LH-2007	LH-2008	LH-2015
LBO-5825			●		●				●
LBO-518			●		●				●
LBO-516			●		●				●
LBO-526		●		●					●
LBO-524(L)		●		●					●
LBO-523		●		●					●
LBO-522		●		●					●
LBO-514A	●			●			●		
LBO-513A	●			●			●		
LBO-325	Carrying case LC-2221					●		●	
LBO-324	(with front panel cover)					●		●	
LBO-323	Common to both the LBO-325,324 and 323					●		●	

RACK-MOUNT ADAPTOR

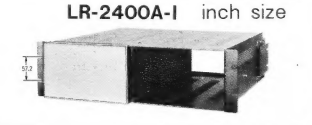
LVS-5850A·5851A
LBO-5860A·5861A·51MA



LR-2400A-M millimeter size



LR-2400A-I inch size



SPECIFICATION CHANGES:

LEADER ELECTRONICS CORP. reserves the right to discontinue the sale of instruments and/or to change the specifications of instruments at any time without responsibility for the incorporation of new features in the instruments already sold.

ORDERING INSTRUCTIONS:

When inquiries or orders are made, please specify the VOLTAGE of the power supply source, the FREQUENCY, the TV System etc. of the locality where the instruments are to be used. The instruments can be furnished for AC line voltages of 100, 120, 220 or 240 volts and designed to operate at the voltages which are within ±8% of the rated line voltages.

LEADER ELECTRONICS CORP.

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AGENT

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